RAILWAY ENGINEERING
and Maintenance of Way

Published by the
CRANDALL PUBLISHING COMPANY

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Office of Publication: Security Building
Corner Madison St. and Fifth Ave.
CHICAGO
Telephone, Main 3185.
Eastern Office: Room 714-716, 132 Nassau Street, New York City
Telephone, 3524 Beekman.

A Monthly Railway Journal

Devoted to the interests of railway engineering, maintenance of way, bridges and buildings.

Communications on any topic suitable to our columns are solicited.

Subscription price, $1.00 a year; to foreign countries, $1.50, free of postage. Single copies, 10 cents. Advertising rates given on application to the office, by mail or in person.

In remitting make all checks payable to the Bruce V. Crandall Company.

Papers should reach subscribers by the tenth of the month at the latest. Kindly notify us at once of any delay or failure to receive any issue and another copy will be very gladly sent.

Entered as Second-Class Matter April 13, 1905, at the Post Office at Chicago, Illinois, Under the Act of Congress of March 3, 1879.

VOL. III CHICAGO, AUGUST, 1907 NO. 8

Contents

Sand Blast in Bridge Painting.

THE application of the sand blast in the process of repainting steel bridges has considerably reduced the cost of labor and made possible better results by thoroughly removing rust and foreign materials from the steel. In order to obtain the best results out of any paint it is essential that all the bridge members be free from scale, rust, dirt, greases, etc.

Previous to the use of sand blasts, the common method of cleaning bridge members was by hand. The method was unsatisfactory for the reason that the cleaners could not cover as much surface as the painters and, consequently, the tendency for the cleaners was to neglect their work in order to keep ahead of the painters. This practice resulted eventually in breaking the continuity of the coat of paint and allowed the moisture and gases of the atmosphere to come in contact with the metal. On this account oxidation of the steel occurred in places where the paint remained intact.

In the use of the sand blast experience has taught us that, for ordinary work, an air pressure of 80 pounds per square inch is ample and efficient, removing all objectionable substance from the steel. Comparative tests with different air pressures, using the same size of nozzle, were made with the following results: At 60 pounds pressure, the rate of cleaning was 10 square feet in 7 minutes or nearly 1½ square feet per minute; at 80 pounds, it was 10 square feet in 3¼ minutes or 3 square feet per minute, and at 100 pounds, it was 3 1-3 square feet per minute. These tests have shown that the 80-pound pressure, previously mentioned, gave the most economical working pressure. To secure the best results, this pressure should be constant and, in case the air supply is taken from a main that supplies other injectors, it is good practice to install a small receiver about 18 inches by 36 inches in the air main. This receiver has a tendency to give a steady pressure and to catch any condensation from the air. The condensation can easily be drawn from the receiver.

An advantage of sand blasting is that it secures strong adhesion of the paint on account of the thoroughness of the cleaning, especially upon metal surfaces that have been pitted by rust. Re-entrant angles and difficult corners that cannot be reached by hand are also readily cleaned by this method.

The Convention Of Railway Telegraph Superintendents.

THE twenty-sixth annual convention of the Association of Railway Telegraph Superintendents was attended by large numbers. Greater interest was shown than at any previous meeting of the association. Everyone was so pleased with the variety of profitable papers presented that it was decided to have quarterly meetings in the future. If the same studious attitude is taken in the work of the association at the future meetings, there is no reason why the experiment will not prove successful.

The papers and discussions offered were of exceptional

interest and covered both the old and new fields. Among the papers suggesting new ideas on old subjects are those by Mr. Dailey and Mr. Hope. The paper on "Opportunities in the Telegraph Service" by Mr. Dailey presented some high ideals and, if all the superintendents would cultivate the personnel of the telegraph and station departments of their roads according to the ideals suggested in this paper, it might be consistent to look for very gratifying results. If the ideas advanced by Mr. Hope in the paper on "Education of Telegraphers in Railroad Work" were also carried out, the liability of collisions, caused by inefficient telegraph service, would be considerably reduced.

Messrs. Cellar, Van Akin and Fry presented papers treating on new subjects and of exceptional interest to members of the convention.

On concrete telegraph poles Mr. Cellar is optimistic and claims unlimited possibilities for reinforced concrete in this field of construction. An account of the experiments in the past as well as the proposed tests for the future on reinforced concrete poles was given. The outlook for their adoption is encouraging.

The quality of transmission on long distance telephone service between New York and Chicago, as presented in the paper on "Maintenance and Operation of Telephone Service on Railroad Company's Lines" by Mr. Van Akin, Jr., shows the unsatisfactory condition of this long distance telephone service up to about August, 1906. At this time, a radical change was made in the operation of the system that brought about the present satisfactory service. The officials of the New York Central Lines believe their New York-Chicago service is better than that which may be obtained from the commercial lines.

From experiments on the Chicago, Milwaukee & St. Paul Railroad, much economy is shown in the use of short block signal circuits, as described in the paper on "Dry Batteries" by Mr. Fry. The use of the dry cell in this installation as well as for private line telephone service, synchonizing self-winding clocks, office bells and buzzers has met with satisfaction and the tendency is to use the dry cell in preference to any other.

Causes of Roadway Deterioration.

SOME of the features that tend to deteriorate roadways are poor drainage, heavy rolling stock and motive power, as well as poor ballast, ties, rails and their accessories.

A well drained subgrade is essential to a durable and reliable roadway. The pressure on sub-grade has been experimentally determined to be from one to four tons per square foot over a distance of about eight feet out from the rail and to a depth of five feet. If the subgrade is of dry clay and well settled the maximum pressure of 4 tons does not exceed the safe bearing value per square foot, but this cannot be said, in truth, when the clay is not well drained, for the tendency is to have the entire track structure settle unduly at soft spots occuring at intervals, causing a bad track surface. A convenient and satisfactory way of draining the subgrade is to slope the surface from the center outward with a rise at the center of about 3 to 6 inches according to the width of roadway. While this is a good theory to advocate, there is a question as to its being frequently seen in practice, Occasionally this may be had when the engineer makes persistent attacks on the contractor as the latter is inclined to neglect this if not watched. It would seem that a little more attention to this would afford better roadbeds in the future. On fills through marsh land or in wet cuts a well designed drainage system is necessary for good results, and a failure to provide this will not only mean additional labor to keep the roadway in order but additional renewal.

Sometime ago a section for double track roadway was proposed where the sub-grade slanted from the center of each track inward as well as outward, the scheme being to collect the water at the center in a longitudinal tile drain that emptied by means of cross drains placed at intervals. Needless to say this proposed section did not meet with approval, as the danger of the drain tile becoming clogged as well as the difficulty of keeping in good order were some of its objectionable features.

The ballast should be able to support the track to prevent lateral displacement of the tie, to afford good drainage, to be dustless and of such character as to prevent vegetable growth from obtaining a foothold. Occasionally a shoulder is built of ballast at the end of tie to prevent lateral displacement, and if the ballast is of such material that it retains water this shoulder forms a pocket at the end of each tie that allows water to stand and saturate the tie, eventually causing deterioration.

On tracks that are depressed the supporting value of gravel is about 100 per cent better than that of either cinder or stone whose bearing values are about equal. The stability of gravel seems to vary only slightly with the amount of traffic and weight of rail used. Oiling the ballast decreases the repairs to rolling stock in that it has a tendency to reduce dust on wearing part. It also reduces maintenance of way expenses from a rail renewal standpoint.

Some investigations have been made regarding the effect of motive power and rolling stock upon the roadbed and, in citing a particular case where the counter-balance of the main driver of a locomotive weighed 431 pounds placed 30 inches from the center of the driver 80 inches in diameter, it was calculated that this locomotive, not using its own steam, running at the speed of 80 miles an hour would deliver a 52,000 pound blow or pressure to the rail five times in every second, caused by the unbalanced parts. When the locomotive is using its own steam this blow is somewhat reduced and varies from 14,000 to 34,000 pounds, probably due to the action of steam absorbing some of the unbalanced weight by the vertical components produced in the combined reciprocating and revolving parts. These blows are struck at intervals of about 21 feet. It is claimed by some motive power authorities that this is not in the character of a blow but of gradual pressure, inasmuch as the time of action is only one-fifth of a second. Nevertheless the effect will be much the same as that of a blow and the stresses caused will be similar to those caused by impact.

Bronx Freight Terminal of the Central Railroad of New Jersey.

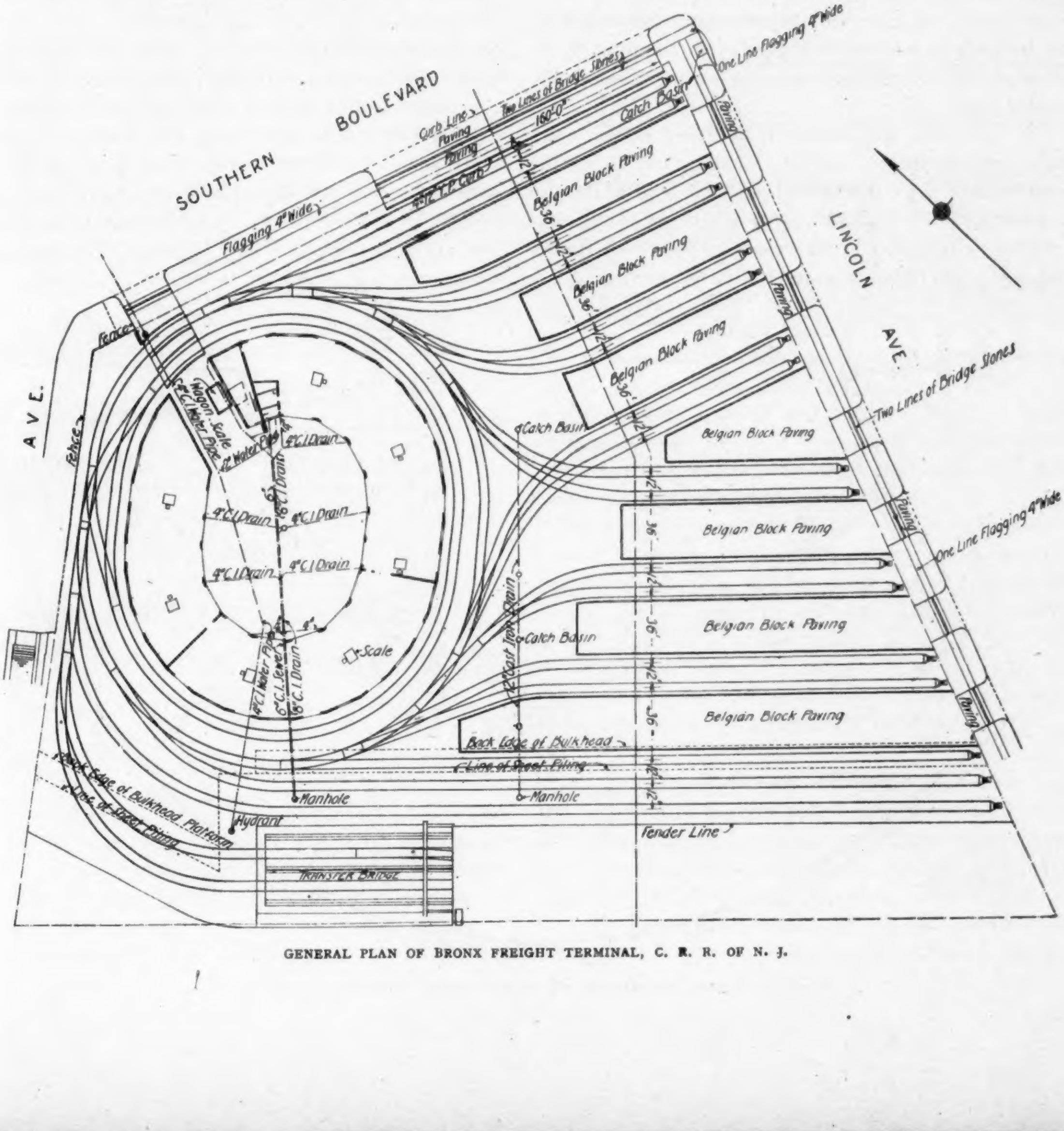
THE Central Railroad of New Jersey is constructing a new freight terminal in the Bronx to relieve the Harlem Transfer Company's terminal that is inadequate to handle the combined business of the Central Railroad of New Jersey, Lehigh Valley and Delaware, Lackawanna & Western railroads.

As the increase of freight traffic in Greater New York is continually increasing and the facilities for handling gradually growing inadequate, the problem of securing adequate railroad property within a reasonable distance of the business district, and incidentally along the river front to provide for necessary ferriage to the various freight terminals, becomes a serious one to the railroads. Ground on Manhattan Island is not available, at a reasonable figure, for the purpose of increasing freight terminal facilities with the result that many mercantile houses receive their freight at terminals in the Bronx and in New Jersey. As the bulk of incoming freight at New York arrives from the west, it is necessary for the railroads to ferry freight to the various terminals in the Bronx and on Manhattan Island.

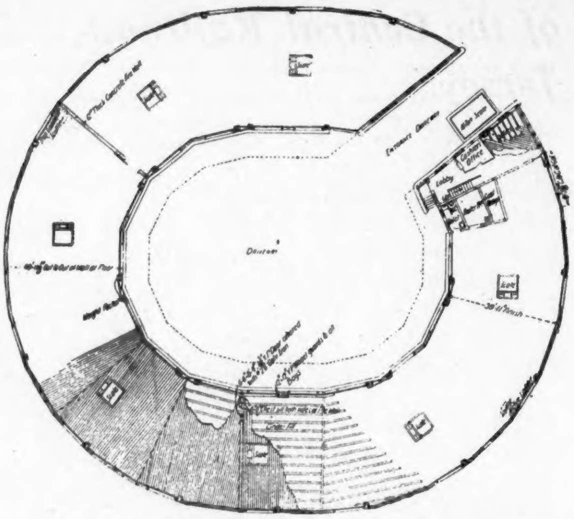
The Harlem Transfer Company's terminal was purchased by the Delaware, Lackawanna & Western Railroad with the purpose eventually of using it exclusively for its own traffic. While this terminal is large enough to handle the traffic of the purchasing road it is inadequate to handle the combined business of the three roads.

The Lehigh Valley and the Central Railroad of New Jersey have procured property on the Harlem river in the Bronx for the purpose of erecting their own freight terminals. During the construction of these terminals the three roads will use the old facilities of the Harlem Transfer Co. as heretofore.

The plot of ground secured by lease and purchase is located on the Harlem river between Third avenue and Lincoln avenue with Southern boulevard as its northern



GENERAL PLAN OF BRONX FREIGHT TERMINAL, C. R. R. OF N. J.



PLAN OF WAREHOUSE. BRONX FREIGHT TERMINAL, C. R. R. OF N. J.

boundary. It is irregular in shape having about 550 feet along the river, 490 feet on Lincoln avenue, 350 feet on Southern boulevard and 310 feet on Third avenue.

Every effort was made in designing the terminal to utilize the entire property in providing sufficient warehouse space, trackage and driveway for teams to meet the demands of business. A plan of this terminal is illustrated herewith and indicates the arrangement finally decided upon.

The warehouse was built in a circular form with two tracks entirely surrounding the building and allows the working of a large number of cars from the warehouse at one time. The interior courtyard is used by teams handling freight in less than car load lots. All car lot shipments, after they are received from the ferry, are switched to one of the 15 team tracks or on the two storage tracks adjacent to the river bank while all cars containing small shipments are spotted at the warehouse to be unloaded.

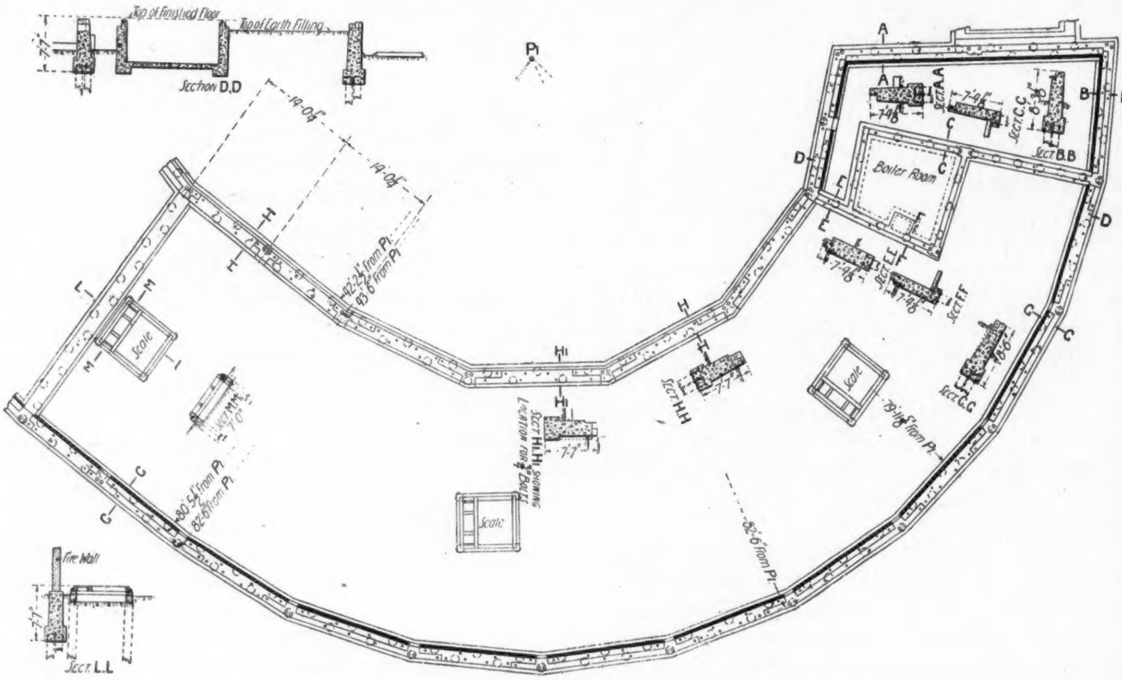
On account of the small space available and the necessity of constructing a complicated track layout with sharp curvatures, it is necessary for a small engine with short wheel base to do the switching at this point. Some of the curves have a 90 foot radius.

The terminal has sufficient trackage to accommodate 110 cars, excluding the main stem used for switching.

The work of grading, filling and providing for drainage of the property was commenced on May 1st. The Snare and Friest Co. are contractors for placing the warehouse foundations. The construction of retaining walls for the transfer bridge was also done by contract work.

The Ramapo Iron Works furnished the steel in track, while the railroad company used its own men for laying. Seventeen Ellis pattern bumping posts were used at the terminal. The driveways to team tracks and courtyard are paved with Belgian block paving, while all crossings over tracks are of yellow pine planking.

There are seven driveway approaches to team tracks off Lincoln avenue and one approach to court yard off Southern boulevard. Flagging with occasional bridge stones was used for sidewalk purposes across driveway approaches and all curbing was of 4 x 12 in. yellow pine. All flag stones were 3 in. thick, 4 ft. wide and 4 to 6 ft. long, while the bridge stones were 8 in. thick, 2 ft. wide and 5 to 8 ft. long. The courtyard is well drained by a system of 4 in. C. I. drains leading to catch basins that are drained by an 8 in. C. I. main. The drainage of the team track driveways is lead to catch basins from

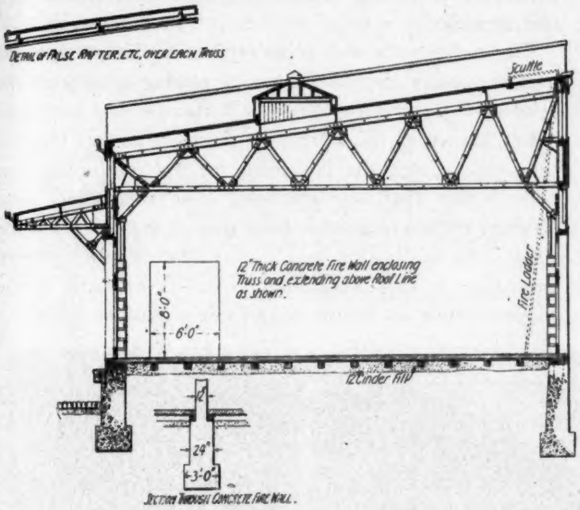


FOUNDATION PLAN FOR WAREHOUSE, BRONX FREIGHT TERMINAL, C. R. R. OF N. J.

where it is handled by a 12 in. C. I. drain to sewerage.

A 4 in. C. I. water main is projected from Southern boulevard that supplies water to warehouse and hydrant near transfer bridge.

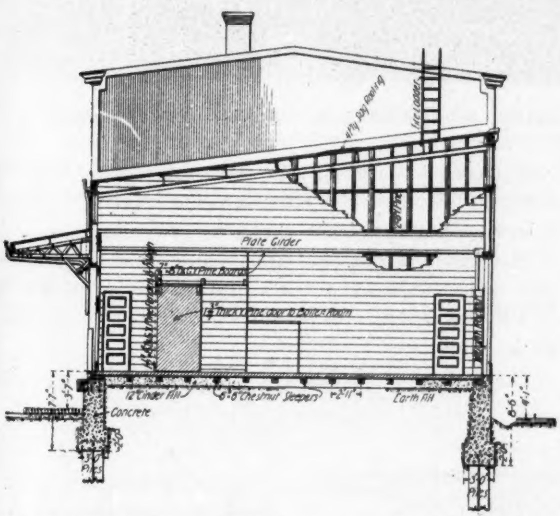
A small pier is built near Third avenue to provide for an engine house 20 by 40 feet. An ash pit is also constructed in connection with engine house. Electric lights are distributed over the yard at important places.



SECTIONAL ELEVATION OF WAREHOUSE, SHOWING ROOF TRUSS, BRONX FREIGHT TERMINAL C. R. R. OF N. J.

The team tracks are laid alternately on 12 and 36 ft. centers, the larger spacing is to provide a driveway for teams handling freight direct from cars.

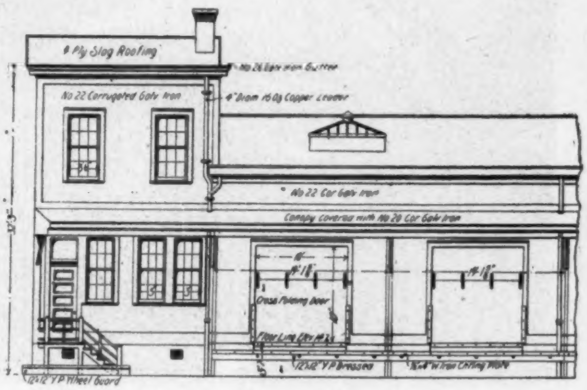
The outer wall of the warehouse is a trifle higher than the inside wall and requires a firmer foundation. The piles of the outer foundation are staggered and spaced about 3 ft. apart on account of the irregularities in the soil, while the piles for the inner foundation are spaced about 3 ft. 6 in. apart.



SECTIONAL ELEVATION OF WAREHOUSE, BRONX FREIGHT TERMINAL, C. R. R. OF N. J.

The warehouse is built elliptical in shape with space provided for driveway entrance to inner courtyard. The outside long diameter of ellipse is about 194 ft. long and the outside short diameter is about 166 ft. long. The courtyard long diameter is about 114 feet long and the short diameter is about 86 ft. long. The driveway entrance is about 26 ft. wide and crosses two tracks. The end of the warehouse at the east side of the driveway entrance, where the wagon scales are located, is built in two stories and this portion of the building is devoted to offices, boiler room, storage, etc. The balance of the building is a single story structure. The building rests on concrete foundation walls and is of steel construction with corrugated galvanized iron sheathing. The side doors are made of two thicknesses of pine boards, laid diagonally and fireproofed by covering both sides and edges with galvanized iron. The building is constructed with a 12 by 12 inch yellow pine guard rail to stand wear given by wagons, securely fastened to wall serving courtyard. A ½ x 4 in. wrought iron chafing plate is attached to the outside of this guard rail.

The door sills are constructed of yellow pine and partly covered with ½ x 4 in. wrought iron chafing plates attached by heavy counter sunk screws. The floor is of 4 in. pine flooring over a 12 in. under fill. Two fire walls are constructed of concrete 12 in. thick and divides the building into three sections.



EAST ELEVATION OF WAREHOUSE, BRONX FREIGHT TERMINAL C. R. R. OF N. J.

The building is equipped with seven weighing scales located in the center of the floor at regular intervals. Ventilated skylights set on wood curbs, covered and flashed with 16 oz. copper are used. The entire building is covered with a 4-ply slag roofing.

We are indebted to the engineering department, Mr. Joseph O. Osgood, chief engineer of the Central Railroad of New Jersey, for plans herewith presented.

Railroad Mileage.

IT is estimated that the railroad mileage in the whole world at the end of 1905 was 562,780 miles, divided by continents as follows: Europe, 192,251 miles; Asia, 50,593 miles; Africa, 16,538 miles; North America, 253,098 miles; South America, 32,859 miles, and Australia, 17,441 miles.

Roadway Concrete Construction.

C., B. & Q. Ry.

THE Chicago, Burlington & Quincy Railway is doing some interesting reinforced concrete construction on subways and retaining walls in connection with the work of elevating its tracks at Chicago.

The district over which this track elevation extends is between Western avenue and Canal street, a total distance of about 2½ miles. It is not expected that the elevation of the entire Western avenue yard will be completed before the latter part of 1908. Prior to beginning the track elevation there were four main tracks while the elevated roadway is to have six tracks to provide for the constantly increasing traffic.

Each track is to be carried over subways on four spans of reinforced concrete deck girders, resting on concrete abutments as well as structural steel and reinforced concrete columns.

These subways were originally designed to be of reinforced concrete floor slabs resting on steel cross girders and the steel columns were to be supported on floating concrete foundations. On account of the soil in this district being of soft blue clay and not having sufficient bearing power to sustain load with the widest possible spread of foundation, piling was finally used and driven to hard pan or rock.

Fig. 1 shows the steel cross girders in place at Ashland avenue subway and the method of placing by derrick the reinforced concrete girders, or slabs as they are commonly known on the work. To the right on this illustration will be seen the falsework for the reinforced concrete bridge that is constructed over 16th street near Ashland avenue to provide for a spur to the Otis Elevator Plant. As this bridge is on a curve and required special sized slabs, it was thought best to build forms and do the concrete work on the ground to suit conditions. The reinforcement was arranged during construction. It is the intention to support this structure on reinforced concrete columns when completed.

FIG. 1—PLACING CONCRETE SLAB WITH DERRICK ON ASHLAND AVENUE SUBWAY, ALSO THE CONSTRUCTION OF THE REINFORCED CONCRETE SUBWAY OVER 16TH STREET FOR SPUR TO OTIS ELEVATOR PLANT, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

The plan, illustrated in Fig. 2, indicates the type of subway under construction but all future new work will be of different design with reinforced concrete columns, etc., as described later.

The bridges are designed for Cooper's 50 loading with

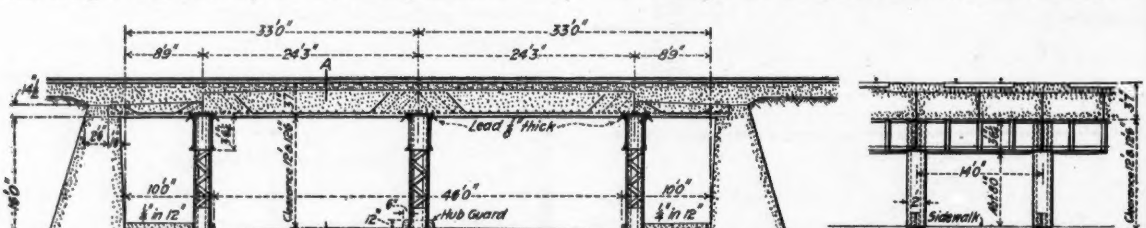


FIG. 2—DETAIL OF SUBWAYS CONSTRUCTED WITH STEEL COLUMNS AND CROSS GIRDER, AS WELL AS REINFORCED CONCRETE GIRDER SLABS, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

a 100 per cent impact allowance and with the assumption that the whole load acts on a strip 10 ft. wide. As will be seen the circular concrete piers are 3 ft. 8 in. in diameter and go to hard pan or rock while the abutments are supported on piling driven to the same depth as piers. This form of foundation reduced the liability of settlement to a minimum.

This type of subway provides about 12 ft. for driveway clearance and about 8 ft. for sidewalk.

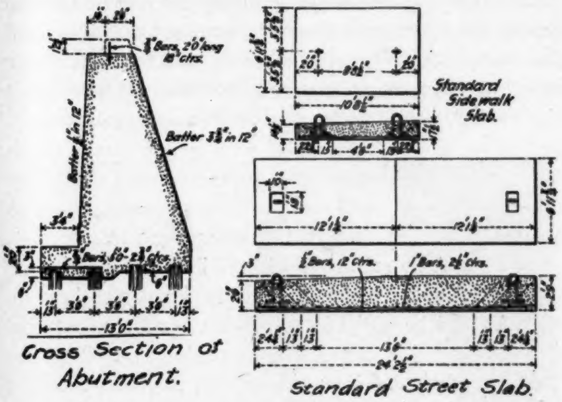


FIG. 3—TYPICAL SECTIONS, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

The standard street slabs, illustrated in Fig. 3, are 24 ft. 2½ ins. long by 6 ft. 11¾ ins. wide and 2 ft. 9 ins. thick for one-half its length and reduces to 2 ft. 6 ins. in thickness from the center to the sidewalk end to provide for drainage.

The standard sidewalk slabs are 10 ft. 8½ ins. in length by 6 ft. 11¾ ins. in width and 1 ft. 5½ ins. in thickness at the street end and reduce to 1 ft. 2 ins. in thickness at the abutment end to give a 3 inch drainage drop. The slabs contain about 1.29 per cent reinforcement of corrugated steel bars, arranged as illustrated in Fig. 3. Some slabs were made 6 ft. wide to provide for tracks laid on 12 ft., 13 ft. and 14 ft. centers. A plan and sectional elevation of the form used in making slabs is presented in Fig. 4 and as will be seen the forms are of simple and durable construction. Each side of the form is complete in itself and in assembling them the sides are set to template laid on the floor of the box. This practice insured more uniformity in the size of slabs as there was a minimum clearance of only ¼ inch allowed for each slab.

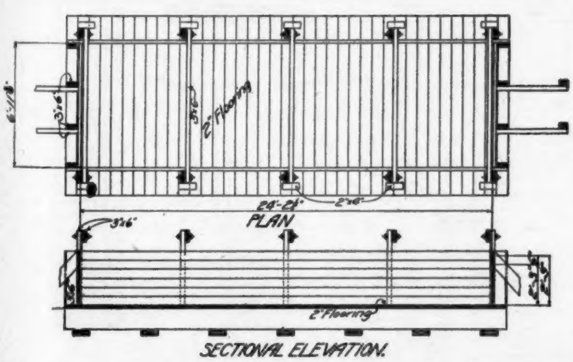


FIG. 4—DETAILS OF FORM FOR MAKING SLABS, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

The slabs are made at a small plant arranged for that purpose located west of the Western avenue yards. After the slabs are formed and tamped they are allowed to set from three to four months before putting in track.

All standard slabs are made of 1:4 gravel mixture and are provided with two hooks conveniently arranged to allow of handling the slabs by derrick. The large street slabs weigh about 34 tons and are handled with a derrick that has a 40 ft. boom. The derrick is used for handling them at the plant where manufactured as well as placing them in position on the bridge. The edges of all slabs are painted with a waterproofing compound before the slabs are put in use. All joints were made watertight by calking with oakum at the bottom and then applying a waterproofing compound. In case there was any space remaining after the waterproofing compound was applied it was filled with grout.

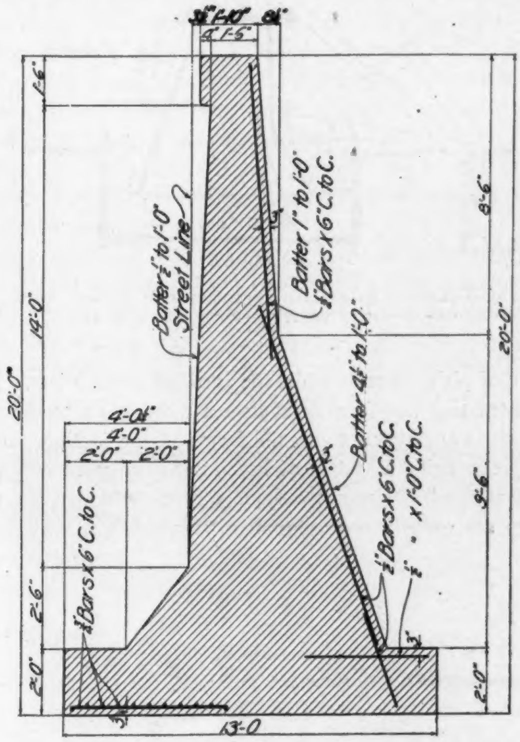


FIG. 5—SECTION OF RETAINING WALL, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

A sheet of lead ⅛ in. thick was laid on top of the cross girders to protect the steel as well as spreading a small coat of mortar over that portion of the lead covering, that acts as bearing surface for the slab to insure maximum bearing surface. A special parapet slab was used for the sides of the bridges, that is narrower than the standard slab, and has a parapet 4 ft. ¼ in. high from the bottom of the slab. The abutments are of a 1:4½ gravel concrete and are reinforced with ¾ in. corrugated bars as indicated in Fig. 3.

All exposed edges of concrete are finished to a curve of small radius.

There are to be 15 subways constructed and the number of tracks carried will vary from 6 at Blue Island avenue to 42 at Robey street. The subway at Robey street serves the Western avenue yards.

A cross section of the typical reinforced concrete retaining wall is illustrated in Fig. 5 and represents a design of wall that is but little more difficult to construct

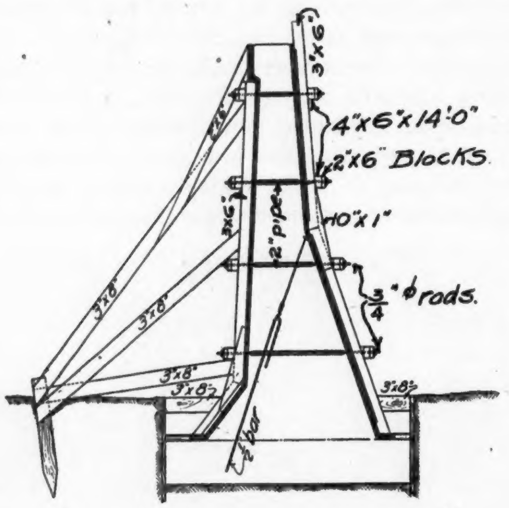


FIG. 6—METHOD OF BRACING RETAINING WALL FORMS, ROADWAY CONCRETE CONSTRUCTION. C. B. & Q. RY.

than of plain concrete while the yardage is much less. In constructing this form of abutment there was a tendency for the wet concrete to lift the forms off the footings, and to prevent this a system of bracing, as indicated in Fig. 6, was used. It required some careful workmanship to keep the walk in true alignment, as any slight variation of the coping could be easily detected. The top brace of the form aided in keeping the coping in true alignment during construction.

The use of long bolts or rods for fastening wall forms together was preferred to wire as the latter has a tendency to stretch and frequently break permitting forms to spread. The forms can be filled with wet concrete to a depth of 15 or 20 ft. without danger when bolts are used for bracing. Scrap piping was used to cover rods and prevent grout from getting in contact with rods. The rods were removed after the forms were taken down. The ends of the pipes were stuffed with waste during construction to prevent grout filling the pipe. Another method for closing the ends of the pipes is with a small wood block placed between the form and the ends of the pipes, the block being later removed and the holes filled with mortar. There were cases where these methods were ineffective as the pipes filled with grout that made it difficult to remove rods. The increased cost of rods and pipes over wire is small and the labor in placing the rods is considerably less than that of arranging wires.

All future new subway work will be constructed as indicated in Fig. 7, which is of reinforced concrete throughout. As will be noticed the column reinforcement consists of four 3½ in. x 3½ x ½ in. angles, 11 ft. long, riveted at intervals to 6 in. x ½ in. x 17¾ in. plates that hold them in position. No. 11 high carbon steel wire is wrapped around the steel work, spaced 3 in. to the lap from the bottom of the cross girder to the top of the foundation. The angles of the columns project well into the foundations as well as the concrete cross girder. The completed column measures 2 ft. square. The cross girders are reinforced with 1 in. and 1½ in. corrugated steel bars arranged as indicated in illustration. The completed cross girder is 4 ft. deep at the smallest section and 2 ft. 6 in. wide.

This construction is under the supervision of Mr. W. L. Breckenridge, engineer for the Burlington lines east of the Missouri river and under the immediate charge of Mr. F. L. Stone, engineer of track elevation, and Mr. C. H. Cartledge, bridge engineer.

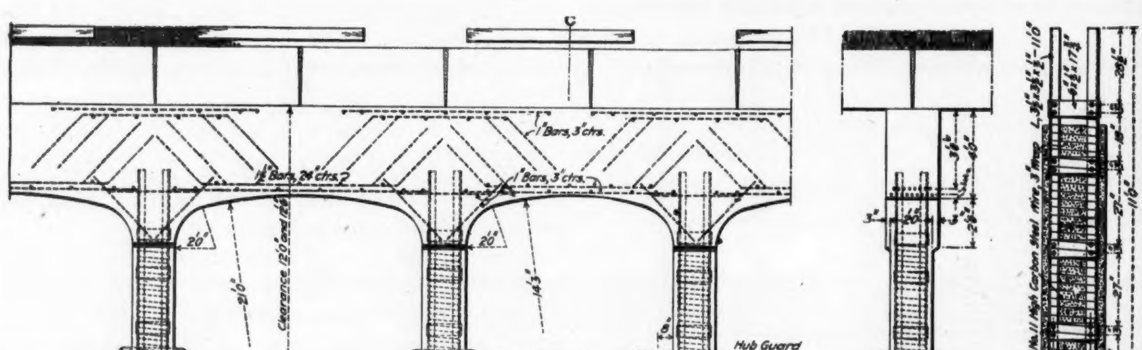


FIG. 7—DETAILS OF REINFORCED CONCRETE COLUMNS AND CROSS GIRDERS OF SUBWAYS FOR FUTURE NEW WORK, ROADWAY CONCRETE CONSTRUCTION, C., B. & Q. RY.

New Union Passenger Station at Seattle, Washington.

A NEW union passenger station has been erected at Seattle, Washington, to serve the Great Northern, Northern Pacific and Columbia and Puget Sound Railroads. The following data and illustrations have been furnished us by Messrs. Reed and Stem, New York, architects of the station.

The building is 140 feet wide, 330 feet long, and three stories high. To secure an adequate foundation in a somewhat yielding and mucky soil, recourse was had to wood piles about 40 feet in length. The foundation piers are of concrete, iron rods being used about the pile heads to overcome any tendency of concrete to crack or split.

NEW UNION PASSENGER STATIONAT SEATTLE, WASHINGTON.

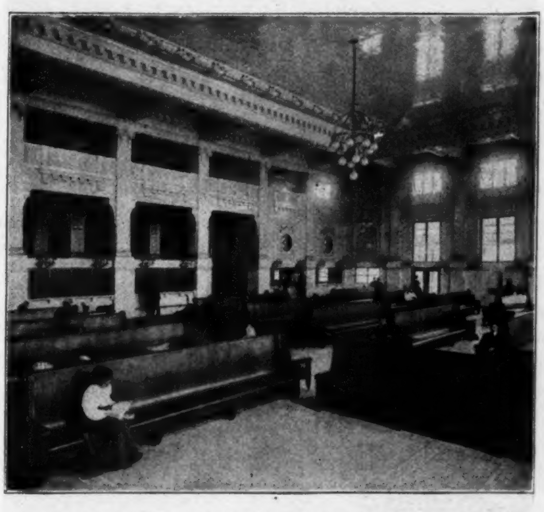
Granite is used to face the walls of the first story, and vitrified brick for the second and third stories, laid with wide joints, with terra cotta trimmings. The roof is green glazed tile.

The distinguishing feature of the exterior is the campanile-like tower, rising to a height of 240 feet to the finial, or 180 feet to the center of the clock dial, which is 12 feet in diameter, the figures being easily read from below. It might be mentioned that this is the master clock and automatically regulates all the smaller clocks about the building. The tower is supported on a steel frame, the masonry serving as an enclosure and not to sustain weight. The walls are slightly battered to overcome any appearance of top heaviness. Means of ascent is provided by an iron stairway on the interior. Above the clock dial is a platform, protected by a high iron fence, completely surrounding the tower, affording a view of the entire city. The tower is roofed with glass tile.

The roof of building is carried on steel trusses, those over main waiting room being supported on steel columns. The roof over baggage wing, also serving as a carriage concourse, is supported on concrete segment arches, built on centers of corrugated iron which were left in place. The haunches of each arch rest on the lower flange of the I-beams, five feet apart, from which the centers are sprung. The roof is thoroughly waterproofed but, as an added precaution, any water chancing to seep through is caught and carried off through pipes.

On three sides of the building a glass marquee projects over the platforms, from 18 to 24 feet, according to location. Incoming passengers, after leaving trains can pass through enclosed concourse at south end to King street, or through building to stairway to Jackson street, without entering waiting room, although direct communication is afforded between waiting room and train platforms. The shelters between tracks are of the "Umbrella" type, avoiding the smoke and dirt usually incident to the ordinary train shed.

By reason of the location on which it is built, access is gained to station from two streets on different levels. The tracks and all accommodations for passengers, including waiting rooms, ticket office, toilet rooms, dining room, baggage and express rooms are on the first floor or lower level, that of King street.



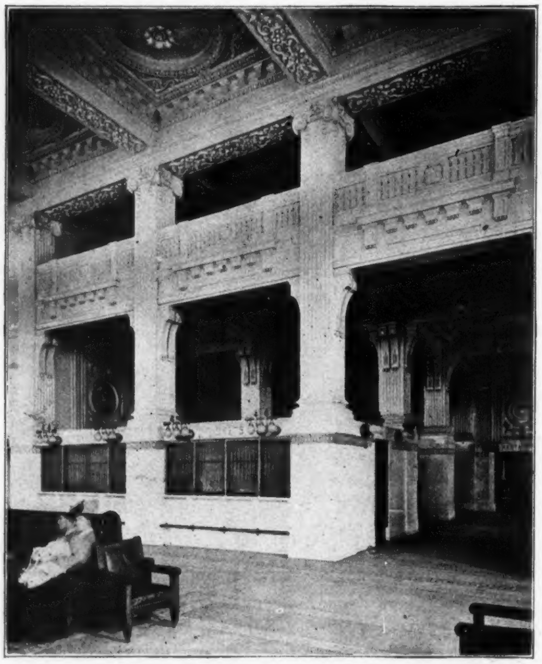
WAITING ROOM, NEW UNION PASSENGER STATION AT SEATTLE, WASH.

The second floor contains offices, and is on a level with the roof over baggage and express room wing. This portion is used as a carriage concourse, mention of which is made, being flanked on either side with concrete pavements for pedestrians. The wall on each side of this one-story wing is carried up in the form of a parapet and is ornamented by electric candelabra, placed every fifteen

feet. This concourse opens off Jackson street, about twenty-two feet above King street. From here, access to waiting room is obtained by the stairway on the west side leading to a large vestibule opening from King street.

The third story above King street is entirely devoted to offices of the Engineering and Operating departments of the Great Northern Ry., and with the second story is provided with the customary vaults, record rooms, toilet facilities, etc.

The waiting room is 75 feet wide, 105 feet long and 32 feet high, rising above the second floor, and open to same by means of corridors, which serve as balconies, on two sides. The floor is marble, mosaic and terrazza, arranged in geometric designs. A wainscoting of English vein Italian marble extends to a height of 8 ft. 6 in. entirely surrounding waiting room. The cap, a foot in width, marks the height of doors and ticket office and parcel room grills. A six inch band of glass mosaic placed underneath wainscot cap is used with telling effect and adds to the appearance of the interior. Large pilasters spaced every 15 feet surmounted by Ionic capitals surround the room. The walls and ceiling are finished in ornamental plaster, the surface of the latter being broken up into panels by beams. Light is admitted through large windows between the pilasters, the upper section of each containing two sash and are operated from below by gang openers. In two corners of the room are telegraph offices for the use of traveling patrons. On the north side are the ticket office, news and parcel rooms.



INTERIOR VIEW SHOWING TICKET OFFICE AND MEZZANINE, NEW UNION PASSENGER STATION AT SEATTLE, WASHINGTON.

Opening from the main waiting room is the women's room, finished with materials similar to those described. This room may be characterized by the appropriateness of its ornament, refinement of details, and the general treatment, consistent with the purpose for which the room is intended.

INTERIOR VIEW, NEW UNION PASSENGER STATION AT SEATTLE, WASH.

Traversing the building from east to west is a large corridor thirty feet in width, which separates the waiting room, ticket office and toilet facilities, from the dining room and baggage room. Four public telephones are located in booths between waiting room and corridor. The ticket office and parcel room also have windows on this corridor, which arrangement allows a passenger to purchase his ticket, check his baggage—checking space being on opposite side of corridor—without undue confusion or loss of time.

The dining room has in connection ample kitchen accommodations, with pantry, refrigerator and storage space. Kitchen vent is connected with general ventilating system, all smoke and vapors being collected, drawn through same and exhausted into open air by means of a four foot exhaust fan located in back of tower. Foul odors from all toilet rooms are also removed in this manner, a four inch galvanized iron pipe opening into wainscoting back of each fixture connects with a larger duct, which increases in size as the smaller ones join it, finally discharging through fan.

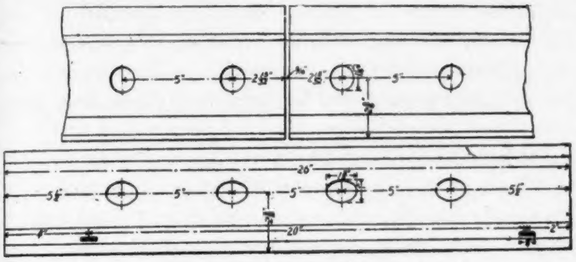
Care has been observed in finish of the interior with reference to the prevention of an accumulation of dirt. In all toilet rooms, floors and wainscot are of marble that can be readily cleaned. The wainscot is kept flush with plaster, thus avoiding all ledges in these rooms. Where the nature of the material permitted and where it did not interfere with the character of the ornament, the internal angles are rounded to facilitate cleaning.

The building is illuminated by means of electric lights. Heat is supplied from an outside heating plant, steam main being laid in a tunnel underneath building next to outside walls, which arrangement permits of repairs at any time. Radiators are fed from this main and are located in recesses in the wall wherever possible. They are supported above floor on brackets, and have spread sections to facilitate cleaning. A vacuum system of heating is employed.

Santa Fe Experimental Wide-Base Rail.

THE Atchison, Topeka & Santa Fe Railway made an interesting experiment with wide-base rails on their line between Ortiz and Cerrillas, N. M., where the grade is 1.43%.

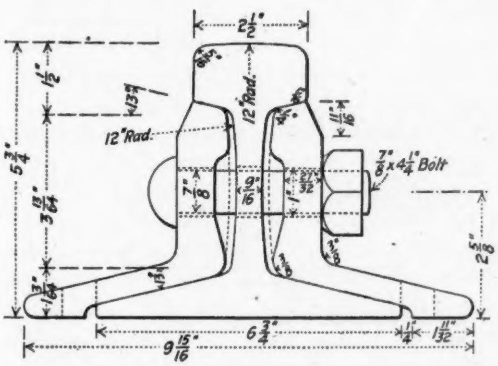
As the life of ties is greatly reduced by rail cutting it was suggested that the width of rail base be increased in order to give a larger bearing surface upon the ties. This suggestion was heeded and a sufficient number of wide-base rails to lay about five miles of track were rolled with greater difficulty than the ordinary standard A. S. C. E. section. In order to roll and finish the wide, thin flanges at the proper temperature it necessitates the temperature of the ball of the rail to be too high for the production of steel of good wearing qualities. The additional width of base is of little or no value at the unsupported parts, between the ties.



RAIL DRILLING AND ANGLE BAR PUNCHING ON WIDE-BASE RAIL.

The rail is 5¾ ins. high and 6¾ ins. wide at the base and weighs 101 lbs. per yard. A cross section of the rail as well as a diagram of the rail drilling and angle bar punching are herewith illustrated.

A 26 in. angle bar, weighing about 75 lbs. per pair and punched with 4 holes for ⅞ in. bolt spaced 5 ins. from center to center, was used at rail joints. The form of the head of the rail is that of the standard 85 lb. Am. Soc. C. E. section. This rail was designed for the purpose of giving a larger bearing upon the ties, and doing away with tie plates. The results are said to have been satisfactory as far as reducing the wear on the ties, but it has been found that the rails break very readily in the base. The Santa Fe railroad reports as having several rail fractures in the five mile stretch that they have under observation and as a result of the experiment it is not the intention of the railroad company to place any additional orders for this section.



SECTION OF WIDE-BASE RAIL.

Probably the best rail section thus far in use is where the width does not exceed the height and the best results obtained from tie protection is the use of steel or wooden tie plates.

*Dry Battery for Block Signal Wires.**

BY U. J. FRY, C. M. & ST. P. RY.

IN 1905 we placed 16 dry cells on the block wire at each of two stations, Brookfield and Waukeska. On account of earth currents at Waukesha, we used one of our other telegraph wires for a return, arranging the keys at both stations with front and back contacts, removing the circuit closers and arranging the circuit to close on the back stop without the battery and on the front with the battery in a manner well known to you all. This circuit, including two 50-ohm sounders, measured 271 ohms. Each cell, when put in service, measured 1.5 volts and .125 ohms internal resistance. At Brookfield we set the battery on a shelf which had been used for gravity battery and left in a somewhat unclean condition. At the expiration of 23 months each cell measured 1.31 volts and 2 ohms internal resistance. At Waukesha we placed the battery far back on a new and clean shelf in the telegraph table, with a closed door. After 23 months each of these cells measured 1.38 volts and .68 ohms internal resistance. We are inclined to attribute the difference in condition of these cells to the condition of the shelves on which they were placed, because the service performed by each has been about the same. We estimate each system of cells has been used approximately 120 times a day, 3,600 times a month, and, if continued, this would amount to 43,200 times a year. We also estimate the keys were closed 3,360 times a day, making dots and dashes necessary to form letters and figures, which, for one month, would amount to 100,800 times, 1,209,600 times a year, or 2,419,200 times in two years. From the way this circuit works now we know it will continue to work two years, and, perhaps, longer. Taking these two systems together we had, to begin with, 32 cells and 48 volts. At the end of 23 months we had 20.96 and 22.08 volts, respectively, or 43.04 volts, a loss of, approximately, 5 volts. The 32 cells cost $5.12.

To secure the same voltage with gravity battery would have required 48 cells at an initial cost of 42 cents per cell, or $20.16 to which we add the expense for maintenance at $1 per cell per year, making a total of $68.16 for one year, and $116.16 for two years.

For each additional two years the expense for maintenance would be $5.12 and $96, respectively, for dry and gravity cells.

At present about two gravity cells per mile are used on block wires on many of the western and some of the

*Paper read at the annual meeting of the Railway Telegraph Superintendents.

eastern roads. Many of the block stations are closed during the night, and the arrangement of the dry cells to provide for the extended sections at night will, we assume, take double the number of dry cells, or four per mile, to accomplish the same results.

Assuming the life of the dry cells properly installed and maintained to be two years, we will estimate the maintenance only on a 100-mile block wire circuit for a period of 10 years, as follows:

One hundred miles, at 2 cells per mile gravity, would require 200 cells. To secure the same voltage we should need 133 dry cells, but on account of the longer sections at night 266 dry cells would be necessary.

For a term of 10 years each gravity cell would cost $10, while the dry cell only 80 cents, or comparatively,

Gravity	$2,000.00
Dry	212.80

I would not recommend cutting down the number of dry cells to the same voltage, but would recommend using twice as many dry cells as you would use of gravity, and thus secure 50 per cent more current to start with, and sufficient to hold up the service near the end of each two years. I estimate the total expense as follows:

200 gravity cells, 10 years	$2,000.00
2,000 dry cells, 10 years	320.00
A saving of	$1,680.00

This would make a saving of $168 per year, or $1.68 per mile per annum.

In addition to this we do not need battery cupboard space in our stations, and are free from the accumulation of dirt, etc., accompanying gravity battery, and save the services of the lineman at each battery station four times a year, which is now an expense of about $10 per battery station per year.

We are about to equip two block wire circuits, one 285 miles and the other 125 miles long, with the dry batteries. A special key and a two-lever three-point switch have been designed to take the place of the old standard telegraph key and one-lever two-point switch, for the purpose of preserving in a block wire all the good features. While we eliminate the only objection to the present arrangement, namely, the operator at one station is unable to extend the circuit between the stations on each side of him without cutting his entire set out. This will prevent the signals passing any office and overcome the danger of operators making mistakes which are liable now when the circuit is cut through as above referred to.

In addition to using dry battery for our block wires, I shall submit a proposition to the telegraph company before long for the use of dry cells on our short branch lines, where there are only two or three offices, and where but a small amount of business is transacted. We are also using the dry cell exclusively in connection with our private line telephone systems, and use it in connection with our synchronizing self-winding clocks; also in our office bell and buzzer service; in fact, we use the dry cell wherever we can, to the exclusion of all others.

Terminal Warehouse at Atlanta, Ga.

Louisville & Nashville Railroad.

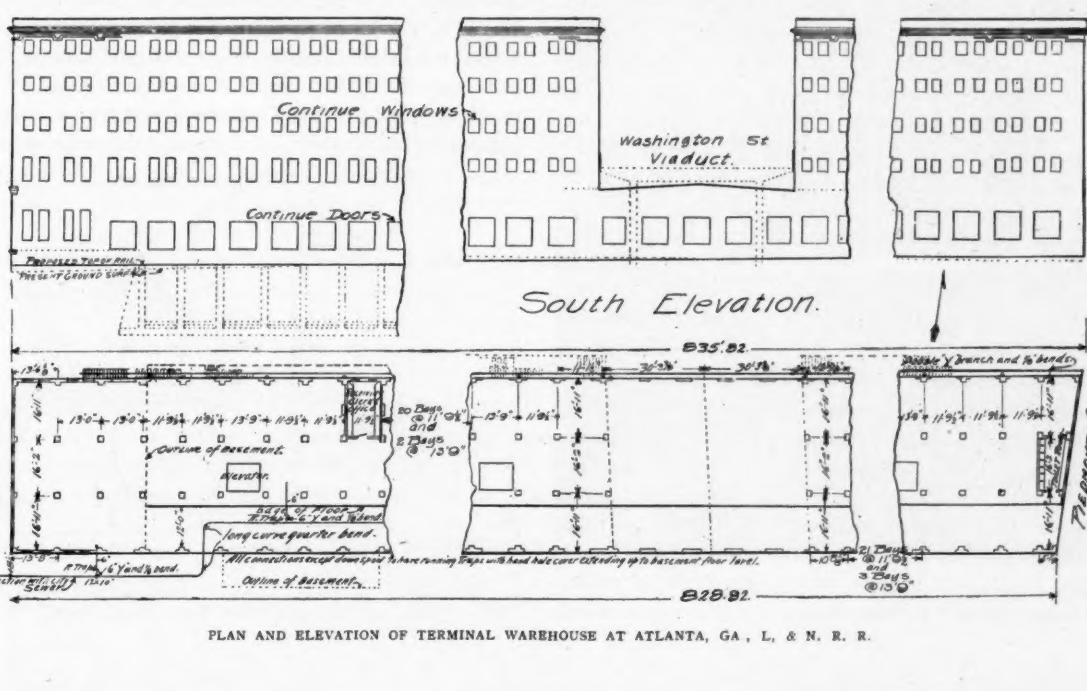
THE Louisville & Nashville Railroad has recently completed a five-story reinforced concrete terminal warehouse at Atlanta, Ga., within two blocks of the central business district of the city. This improvement is a part of the work being executed by the Louisville & Nashville R. R. to obtain a direct freight route between Cincinnati and Atlanta. In endeavoring to obtain desired direct route the Louisville & Nashville railroad has acquired the Atlanta, Knoxville and Northern Railroad, an independent line operating between Knoxville and Marietta, Ga., and the Knoxville, La Follette & Jellico Railroad, also an independent line. The latter road was extensively improved and a new line was projected from Etowah, some distance south of Knoxville, to Cartersville, Ga., about 48 miles west of Atlanta. The two roads absorbed and new line constructed, together with track already owned by the Louisville & Nashville Railroad, gives the latter a through route between Cincinnati and Cartersville, Ga. The Western & Atlantic Railroad handles the traffic from Cartersville to Atlanta. The former route that this traffic used to take was from Cincinnati via. Louisville, Ky., to Nashville, Tenn., and thence over the Nashville, Chattanooga & St. Louis Ry. to Atlanta, Ga.

The new warehouse is 50 x 836 feet long and will be used as a freight terminal to provide for additional traffic as well as for storage purposes. The first floor of the warehouse will serve, exclusively, the freight business of the railroad. The upper floors are rented to merchandise establishments for storage purposes as the building is located near the business portion of the city. Eight electrically operated elevators, with a capacity of 4 tons each, are provided for handling freight to and from upper floors. With this arrangement freight can be taken from cars and stored in freight house and later delivered direct to consumer when desired. Office room is also provided on upper floors for the accommodation of merchants. The upper four stories are cut about the middle of the building for about 60 feet to permit passage of the Washington street viaduct, under construction by the city of Atlanta. The building has three longitudinal bays on all floors, the center bay is 16 ft. 2 in. wide, while the outer bays are 16 ft. 11 in. wide. All stories, with the exception of the first, are spaced 11½ feet vertically and on

account of the elevation of street the height of the first floor varies from 14 feet on the east to 18 feet on the west end. The floor slabs are 4¾ in. thick, including ½ in. finishing coat, and are designed to carry a live load of 300 lbs. per square foot. They are reinforced in the direction of the span with ⅜ in. square twisted steel bars, spaced 8½ in. where the floor beams are on 5 ft. 10¾ in. centers and with the same size bars spaced 4½ in. where the floor beams are on 6 ft. 10½ in. centers. To provide against shrinkage cracks and stresses caused by varying temperatures, the floor spans are reinforced at right angles to the direction of span with ⅜ in. tension bars and ½ in. twisted square bars on 18 in. centers. The floor beams are supported on two longitudinal rows of columns, in the interior of the building, and on the side walls. These columns are placed on 11 ft. 9½ in. centers with the exception of eight openings, used for elevator shafts, that are on 13¾ ft. centers. The foundations of the building rest on a firm disintegrated granite that is difficult to excavate and is capable of maintaining 10,000 lbs. per sq. ft. The columns rest on reinforced concrete spread foundations designed to distribute load of 2 tons per sq. ft. on the soil. Each column is reinforced with four vertical rods, one in each corner and held laterally by ¼ in. square bar hoops placed on 12 in. centers. About one per cent of the cross section of the column is reinforcement metal. The columns vary in cross section from 22 x 22 in. on the first floor and decreases to 8 x 8 in. at the top story. Freight is handled direct from car into freight house as there is no platform. The doors of the building are placed at each transverse bay, and the floor of the car and the first floor of freight house are on the same level, making it easy to handle freight. There are 122 8x8 ft. door openings on the first floor equipped with cast iron jambs and sills and fitted with Kinnear rolling steel doors. Sixty-six of these openings are on the south side and serve the cars while the balance is on the north side of the building and serve truck and local deliveries by drayage.

The walls of the building are of reinforced concrete slabs, the interior surface of which was left as the concrete comes from the molds, while the exterior surface was rubbed down and waterproofed. A ½-inch granitoid finishing coat of mortar was provided on all floors. Four rooms for receiving clerks and a toilet room are partitioned off on the first floor. The eight elevator shafts are each 8¼x13 ft. in the clear and run the full height of the building. The elevators serving the office are enclosed in 6 in. concrete walls. The upper stories may also be reached by one of eight sets of iron stairways provided on the outside wall of the building and supported by cantilevers protruding from structure. These stairways are conveniently arranged and entrance to any floor after ascent, is made from stairway platform that is provided at each floor elevation. The window openings in the portion set apart for offices have cast concrete sills and are fitted with metal frames carrying metal sashes glazed with wire glass. The sashes are all pivoted, with the exception of the windows on the office portion on the first and second floors that have double-hung sashes.

Reinforced concrete slabs 2¾ ins. thick were used for the roof. The reinforcement consisted of ¼ in. twisted square bars spaced 14 ins. apart in the direction of span, and at right angles to this with ⅜ in. bars at the same spacing. Seven ply composition roofing laid in tar and finished with gravel was used for covering. Galvanized iron downspouts are provided on sides of the building to carry off water from roof. The Ferro Concrete Construction Company of Cincinnati, Ohio, detailed the concrete design and later erected same. This work was completed one story at a time, no work was attempted on the



PLAN AND ELEVATION OF TERMINAL WAREHOUSE AT ATLANTA, GA., L. & N. R. R.

second story until the first story was finished and so on. Three Smith concrete mixers were conveniently arranged in the building to work in connection with three one yard Ransome concrete hoisting buckets that operate in spaces provided for elevators. Enough lumber forms for concrete were supplied to nearly complete two stories and as the building is symmetrical some of the forms were used for the upper stories. These forms as well as other construction materials were set in place by the use of small boom derricks that were raised from floor to floor as the work progressed. The materials of construction were received in cars on track located near the building. The curtain walls were built in panels between the columns in the side of the building. The floors of the building were completed and the frames set in place before the curtain walls were touched.

The floor slabs of the building, which are of 1:2:4 concrete, were left rough, as coming from the molds, during construction. After the building was completed the floor surface was swept clean, washed with diluted hydrochloric acid and finished with a ½ in. layer of cement mortar. In this process of finishing with cement mortar the acid washes away any milky powder or effervescence that may have formed on the surface of the slabs and permits the new concrete or mortar to combine with old.

The columns, beams, girders and floor slabs were made of 1:2:4 concrete and the curtain walls were made of 1:3:6 concrete. The cement used was the product of the Southern States Portland Company.

Crushed granite that would pass a screen of 1½ in. mesh was used for concrete and all the stone dust from the crusher was used in concrete in place of sand. Little attention was given to the artistic exterior appearance of the building. The large door at the entrance of the office is of ornamental design and a cornice of concrete cast in moulds is provided at the roof line that tends to eliminate appearance of uniformity.

The power plant is located in the basement at the west end of the building near the office and is 100x50 ft. and about 20 feet below the first floor. It contains two electric generators each driven by a Skinner engine that provides power for electric elevators, etc. The exhaust steam of engines will be used for heating offices.

This building is of absolute fireproof construction and was designed to sustain a test load of 1200 lbs. per sq. ft. of floor surface. A number of tests with this loading capacity have been successfully made. The building has been divided into eight sections longitudinally by expansion joints.

The terminal warehouse was designed under direction of Mr. W. H. Courtenay, chief engineer, Louisville & Nashville Railroad and to whom we are indebted for information herewith presented.

Audible Distant Signal in Engine Cab.

Great Western Railway, England.

THE Great Western Railway of England has recently installed a new train signaling system on its branch line, about 22 miles long, between Witney and Fairford, in Gloucestershire. This system is controlled electrically and signals the engineman at the place of each distant signal by an audible cab signal instead of the commonly used semaphore signal. This installation is especially desirable in foggy weather when the visual signals are not distinguishable.

The cab signals are the blowing of a steam whistle that indicates "caution" and the ringing of a bell that indicates "safety." When either one of these signals are set in operation it continues to sound until stopped by the engineman.

The local circuits employed in the installation are indicated in Fig. 1. The caution circuit includes battery B, switch D, electro magnet E, switch S, and return to battery. The "caution" signal is actuated when the contact shoe L is lifted, thus opening switch S and interrupting the local circuit on the locomotive. This releases armature K as well as valve V causing the whistle to blow. The switch D, as may be seen, has no function in the operation of the signal and is merely a steam controlled switch opening the switch when the steam pressure on the engine is below 20 pounds, thus saving the battery when the engine is out of commission.

The "clear" circuit includes battery B^1, switch S^1, contact rail R, contact shoe L, electro magnet E^1 polarized relay P, frame of the locomotive, railway track and ground return to battery. When it is desired to give a clear signal the towerman closes switch S^1 and when the shoe L strikes the contact rail R, a current flows over the closed circuit including the electro magnet E^1 and polarized relay P. The energized electro magnet E^1 prevents the release of the armature K and whistle valve V, while at the same time the armature of the polarized relay

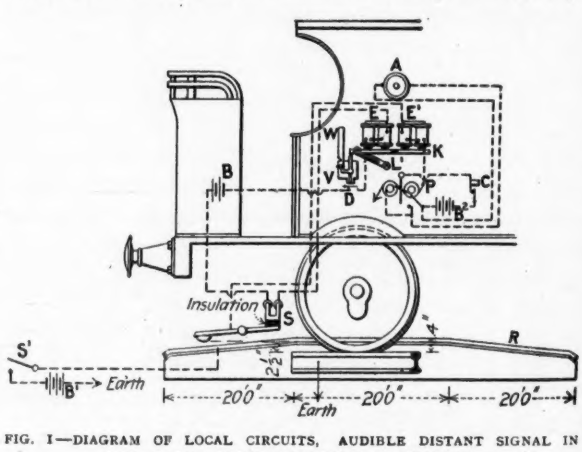


FIG. 1—DIAGRAM OF LOCAL CIRCUITS, AUDIBLE DISTANT SIGNAL IN ENGINE CAB, GREAT WESTERN RY., ENGLAND.

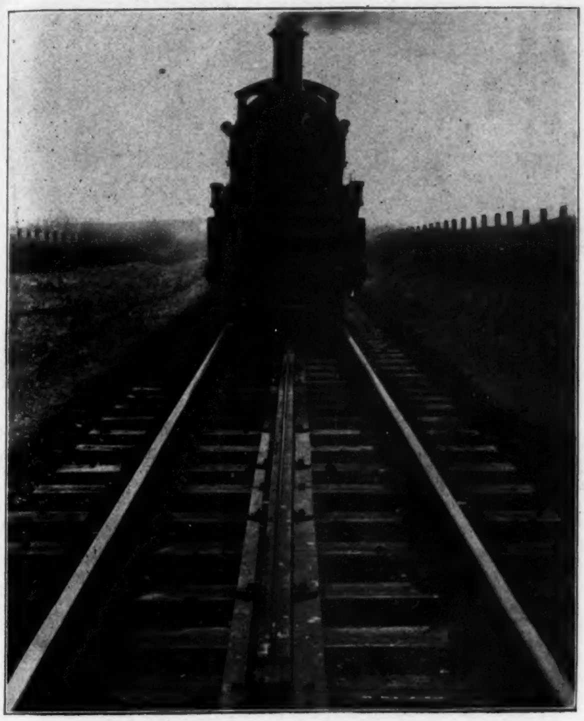


FIG. 2—ARRANGEMENT OF CONTACT RAIL AT DISTANT SIGNAL POINTS, AUDIBLE DISTANT SIGNAL IN ENGINE CAB, GREAT WESTERN RY., ENG.

P closes the local circuit, including the electric bell A, battery B², push button C and polarized relay P. When this bell circuit is closed, and current from battery B² has passed through the second winding of the relay, it continues to remain closed until the circuit is momentarily opened at push button C. The bell therefore continues to ring until the circuit is opened by engineman.

Neither frost, snow or ice, nor electrical failure can prevent the operation of this system as the signal to indicate "clear" must receive a current picked up from the ground contact rail R and a failure to do this will indicate "caution." In case the locomotive passes the distant signal point and receives no signal in the cab it is an indication to proceed cautiously.

The stationary contact rail, illustrated in Fig. 2, consists of a "T" bar suitably mounted and insulated on a timber base, in the center of the track, the highest point of which is 4 in. above the rail level.

The contact shoe L, illustrated in Figs. 3 and 4, is mechanically attached to the locomotive but is insulated from both the engine frame and the switch S. The normal plane of the contact shoe is 2½ ins. above the rail level and when it comes in contact with the "T" bar it raises 1½ ins., making a total of 4 ins. above the level of the rail. When the shoe is in its normal position, the switch S is closed and completes the local circuit energizing the electro magnet E that keeps the whistle valve closed.

Should the shoe accidentally be lifted ½ ins. above its normal plane the switch S will open, de-energizing the electro magnet E and allowing the whistle to blow. The same action occurs when the shoe is raised 1½ ins. by the "T" bar of the stationary contact rail R. The shoe is 7 inches wide and is provided with a spiral spring to insure the return of the shoe to its normal position. It has the wearing surface case hardened and is arranged on the locomotive as illustrated in Fig. 4. Several kinds of shoes were tried but the one here illustrated seems to have given the best satisfaction for high speed.

A lever L¹ is provided for resetting the "caution" apparatus after the shoe has passed over the "T" bar. The line battery B¹ normally consists of 16 No. 2 Leclanche cells; battery B of two large dry cells, and Battery B² of four small dry cells.

At places where high speed is attained the stationary contact rail R is made 60 ft. long while at places of slower speed this rail is about 40 ft. long. It should be long enough to insure that switch S is opened long enough to de-energize electro magnet E.

The "caution" and "clear" signals on each locomotive may be tested before going on the road, as there are two short stationary contact rails installed in both the Oxford and Fairford yards for this purpose.

The signal indicator is located in the upper right hand corner of the cab as illustrated in Fig. 3. The indicator handle is for the purpose of lifting the armature of the electro magnet and stopping the whistle, while the push button, directly below, stops the ringing of the bell.

On single track a contact rail is placed on each side of the signal point so that trains running in opposite direc-

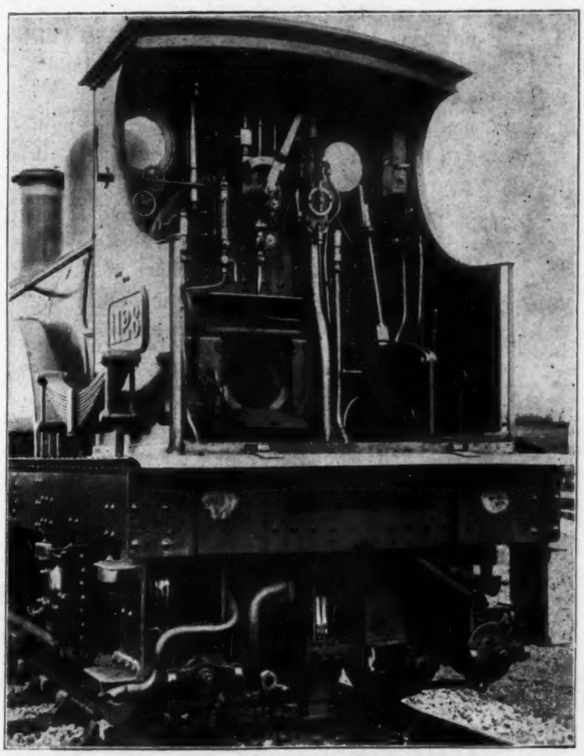


FIG. 3—SIGNAL INDICATOR IN UPPER RIGHT HAND CORNER OF CAB, AUDIBLE DISTANT SIGNAL IN ENGINE CAB, GREAT WESTERN RY., ENG.

tion may only receive signals from the contact rail intended for that direction. The property of polarized relays to operate with current flowing only in one direction is made use of in this installation. When the signal is set to "clear", the contact rail controlling the audible signals for that direction is negatively electrified while the contact rail controlling the opposite direction is positively electrified. In passing over the latter contact rail neither signal will sound as the electro magnet E^1 will be energized preventing the operation of the whistle while the polarized relay will fail to work as the current flows in the wrong direction.

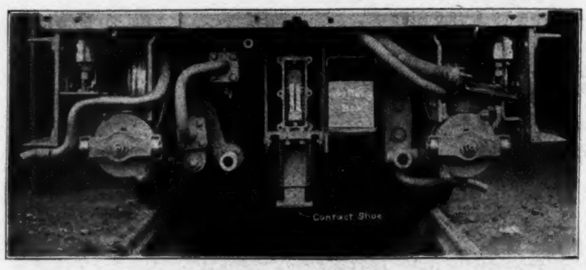


FIG. 4—METHOD OF ATTACHING CONTACT SHOE TO LOCOMOTIVE, AUDIBLE DISTANT SIGNAL IN ENGINE CAB, GREAT WESTERN RY., ENGLAND.

This system was developed and installed under the direction of Mr. A. T. Blackall, signal engineer of the Great Western Railway. We are indebted to "Electrical Engineering" for information herewith presented.

New Yard at Brewster, Ohio.

W. & L. E. R. R.

THE Wheeling & Lake Erie Railroad has recently completed a 2,000 car capacity gravity yard at Brewster, Ohio, the intersecting point of its Toledo and Cleveland divisions. As this yard is centrally located on the system, and of ample size it will be used for classifying the majority of freight over the system. It is intended to establish large shops and a roundhouse at this point making it a terminal for engines and freight crews.

A general plan of this yard is presented herewith and is similar in design to other gravity hump yards, containing the east and west bound classification and departure yards, the east and west bound receiving yards as well as the roundhouse and other service tracks. As will be seen plenty of space is reserved for expansion and the installation of new shops.

Two inspection pits are provided, for incoming engines, at the head of the tracks leading to the roundhouse, where the engineman delivers engine to hostler.

In case the inspection pits are crowded a small storage yard adjacent to pits may be used to deliver engine to hostler. The sand and coal wharf and the ash pit are also located adjacent to the roundhouse tracks between the inspection pits and the roundhouse.

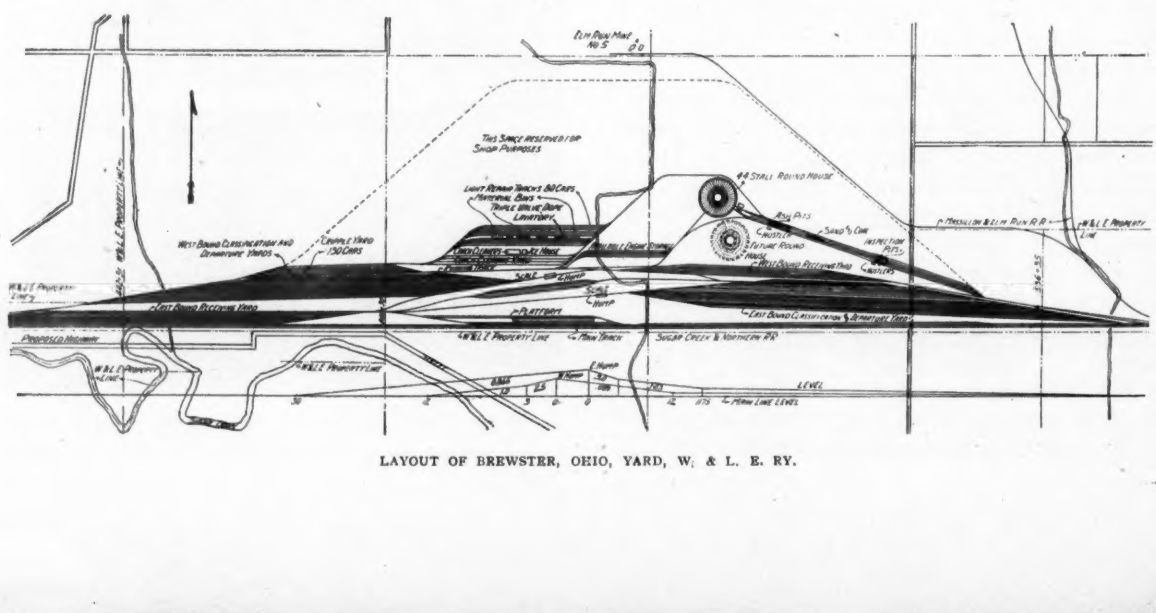
The sand and coal wharf is of the elevated gravity type. The coal is elevated to top of the wharf by an electrically driven cable. Sand stoves and pneumatic apparatus are used for drying and handling the sand to engines.

The ashpits are of reinforced concrete construction and 120 feet long each. Small buckets mounted on narrow gauge trucks are used for receiving the ashes. An electric traveling crane is used to raise buckets and discharge contents to cars standing on an adjacent track.

A platform is provided for transferring cars that are disabled enroute as well as for handling some freight.

A light running repair yard of five tracks is between the humps, where defects of a minor character are handled. This arrangement allows of the rapid handling of cars having slight defects as this yard is pulled frequently. Other repair tracks having a capacity of about 80 cars are also provided on the north end, adjacent to the supply houses.

We are indebted to Mr. H. W. McMaster, general superintendent of the Wheeling & Lake Erie railroad, for illustration herewith presented.



LAYOUT OF BREWSTER, OHIO, YARD, W. & L. E. RY.

The Convention of Railway Telegraph Superintendents.

THE twenty-sixth annual convention of the Association of Railway Telegraph Superintendents was held on June 19, 20 and 21 at the Marlborough-Blenheim Hotel, Atlantic City, N. J. On the morning of the 19th, President E. A. Chenery (Mo. Pac.), called the meeting to order. After the completion of routine business incident to the organization of the meeting, the presentation and discussion of the many interesting papers was begun.

The complete programme for the meeting included the following papers:

H. C. Hope, Chicago, St. Paul, Minneapolis & Omaha, "Education of Telegraphers in Railroad Work."

F. E. Bentley, Terminal Railway Association, St. Louis, "The Superintendent of Telegraph—What He Is versus What He Is Not."

S. L. Van Akin, Jr., New York Central & Hudson River, "Maintenance and Operation of Telephone Service on Railroad Company's Lines."

R. L. Logan, Kansas City Southern, "Error Sheets."

G. W. Dailey, Chicago & Northwestern, "Opportunities in the Telegraph Service."

G. A. Cellar, Pennsylvania Lines, "Experiments with Concrete Poles."

E. A. Chenery, Missouri Pacific, "Methods of Making Commercial Reports."

W. W. Ashald, Grand Trunk Railway, "Visible Supply of Poles."

E. Parsons, Illinois Central, "Uniformity of Office Installation."

W. J. Browne, Iron Mountain, "Operation and Maintenance of Railway Telegraph Service."

W. J. Camp, Canadian Pacific, "Standard Time."

U. J. Fry, Chicago Milwaukee & St. Paul, "Dry Batteries."

L. M. Jones, Atchison Topeka & Santa Fe, "Wire Testing."

William Mayer, New York, "Wireless Telegraphy."

D. R. Davies, Superintendent Construction Western Union Telegraph Company, "Standard Construction."

Robert E. Chetwood, Engineer American Telegraph & Telephone Company, New York, "Special Use of Loud Speaking Transmitter and Receivers in Railway Work."

W. C. Stowell, Chicago & Alton, "Inductive and Other Foreign Disturbances to Telegraph Lines."

John B. Taylor, Railway Engineering Department General Electric Company, "Inductive Disturbances to Telegraph Wires Caused by High Tension Lines Paralleling Railroad Right of Way."

The first paper presented was on the "Education of Telegraphers in Railroad Work," by Mr. H. C. Hope of the C., St. P., M. & O. Ry. During the discussion of this paper, which completed the forenoon session, Mr. Griffith of the Erie invited the members to visit the training school, maintained by his company at Elmira. N. Y.

In the afternoon several papers were read and discussed at length. The first was on "The Superintendent of the Telegraph—What He Is versus What He Is Not," by Mr. F. E. Bentley and the second on "Inductive Disturbances to Telegraph Wires Caused by High Tension Lines Paralleling Railroad Right of Way," by Mr. John B. Taylor of the General Electric Company. The paper on "Inductive and Other Foreign Disturbances to Telegraph Lines," by Mr. W. C. Stowell, was closely allied with the one presented by Mr. Taylor. The discussion included a recitation of the experiences of the members and the means which they had employed to overcome the inductive and other disturbances. In the vicinity of Rochester, N. Y., the fact that metallic circuits were put up to get rid of inductive interference, was developed from the discussion by Mr. Griffith of the Erie.

On the second day, the morning session was opened with a paper on the "Maintenance and Operation of Telephone Service on Railroad Company's Lines," by Mr. S. L. Van Akin, Jr. He described the organization of the telephone and telegraph service on the New York Central Lines, emphasizing the features in which the railroad is at a disadvantage as compared with the telephone companies. Mr. Van Akin described the duties of the monitoring wire chief as follows:

"He should watch the lines closely for any irregularities in the service, such as line trouble, noisy connections or unlawful use of the lines. He should see that employees are attentive to duty, that the rules and instructions for the operation and maintenance of the service are complied with, that employees are courteous in the performance of their work and that all calls are promptly and properly established, and no partiality shown in the matter of precedence to establish connections. He should assist in any lawful way to accelerate the service, establish morning test calls and, whenever necessary to improve transmission, place telephone repeaters in the line and see that they are always in good condition. He should be responsible for the prompt clearing of the line of all switchboard connections on through calls, test the line to ascertain positively whether all switchboard connections, simplex coils, bells, etc., have been removed, and the line connected through at test boards and test panels before establishing the connection. He should keep a complete record of all interruptions and trouble on the line, and inform the Superintendent of Telegraph promptly of such interruption or trouble and advise him when communication is restored. He should check the standard of insulation and resistance of the entire line at least once each month."

The service is limited on some lines except to a few officers, whose calls also have precedence over others. For example, on the New York Central Company's line between New York and Buffalo, and the Lake Shore Company's line between Buffalo and Chicago, unlimited service is accorded to the President, Vice-Presidents, General Managers, Assistant Managers, General Superintendents, Superintendents of Telegraph and Chief Engineers.

The morning session was closed by a discussion of

Mr. Van Akin's paper, in which many interesting facts were brought out. In the afternoon, Mr. G. A. Cellar, of the Pennsylvania Lines West of Pittsburgh, related his experience with telegraph poles which he has put up.

Mr. Cellar reviewed the history of timber and steel poles before he entered upon a discussion of the possibilities of the concrete pole. Concrete poles were used as early as 1856 on the Panama Railroad. These poles were not however of good design.

The first concrete poles, put up by Mr. Cellar, were at Maples, Ind. He described this installation under the title of a progress report, not claiming to have hit upon the most suitable shape.

The poles are 30 ft. long and of two shapes, one square and the other octagonal. The upper third is solid and the lower two-thirds hollow, the thickness of the walls varying from 1¾ in. to 3 in. These poles weigh 3,500 lbs. each and withstand any strains that are likely to be put on them by a line of 50 wires with each wire coated with enough ice to make it 1 in. in diameter. In testing these poles, they were set in concrete bases, 3 x 3 x 5 ft., and they were compared with cedar poles of the same length set in the same kind of base. The concrete poles were reinforced with four round iron rods, 24 ft. long and ¾ ins. in diameter, close to the surface and four similar rods ⅛ in. smaller. The octagonal poles are 13 in. in diameter at the base and 8 in. at the top, tapering 1 in. to 5 ft. Holes are cast in the poles for cross-arm bolts and wooden blocks are set in at suitable places to support galvanized iron steps and cross-arm braces. The poles were tested by a horizontal pull 10 ins. from the top. The concrete poles failed by breaking near the ground line after being pulled from 25 to 39 ins. from the perpendicular with stresses of about 3,000 lbs. The wooden poles bent to arch shape before breaking. The concrete mixture was 1-3.

The next paper was one by Mr. U. J. Fry on the use of dry batteries for short block signal circuits.

This paper was followed by Mr. Logan's on "Error Sheets" received from the Western Union Telegraph Company. The paper describes briefly the method which is used for handling these sheets on the Kansas City Southern.

Mr. G. W. Dailey, of the Chicago and Northwestern, read a paper on the "Opportunities in the Telegraph Service." He describes the ideal agent as follows:

"He realizes the importance and responsibilities of his position. He is the color sergeant of his company. He knows that he is practically the General Manager and everything else at the station, and that the road he represents is gauged by his calibre and is judged as he is judged. It stands in the estimation of the community largely as he stands. He is representative of it. He keeps peace in the family and in the vicinity; keeps his officers posted as to everything of interest in his community; knows he can do more good advertising for the company than anyone else, and does it. He does not complain that his salary is too small, but says he will make himself so valuable that they can not get along without him, and that they will have to promote him, when he will receive more salary. He reasons that so long as he is a part of the organization he wants to be a strong part and do everything to further its interests while he is a part.

"He does not disparage the company he works for, as that would disparage himself. If he can't get in line he will get out. He isn't carrying water on both shoulders. If a member of a labor organization, he is loyal to both and to the advantage of both. If he has any trouble or grievances he does not proclaim them from the house tops, but wisely keeps them in the railroad family and doesn't trouble the general public with them. When his townsmen feel that they should be in fashion and do a littl legislating against the railroads, he knows he can do more than any one else on the road to offset it, and does so. He tells his neighbors some of the good things his company does; gets out and shows people where they are misinformed and what the road has done for their town, even though they won't admit it; explains many things that are not understood; stands by his colors so well that even his opponents respect him for it; tells his town people that his company is the best on earth, and says it so often, and stands by his guns so well that by and by they think so themselves. They also think he is the best agent on earth, and wouldn't have any other. After a while the company finds it out and he is promoted. He has made and improved an opportunity."

Owing to lack of time, papers on "Standard Time," by W. J. Camp, "Railway Telegraph Service," by W. J. Browne, "Visible Supply of Telegraph Poles," by W. W. Ashland and "Uniformity in Office Installation," by E. Parsons, were ordered printed without being read.

Montreal was selected as the place for next year's meeting, and the date is June 24, 1908. The election of officers resulted in the choice of E. P. Griffith (Erie), New York City, president; W. J. Camp (Canadian Pacific), Montreal, vice-president, and P. W. Drew (Wisconsin Central), Milwaukee, secretary and treasurer.

The foregoing completed the business of the second day. On the third day a paper on Wire Testing was read by L. M. Jones (A,. T. & S. F.).

The convention having voted in favor of holding quarterly meetings in the east and in the west, the new president, Mr. Griffith, announced the appointment of Charles Selden, of Baltimore, chairman; L. B. Foley and A. B. Taylor, of New York, as a committee to have charge of the quarterly meetings in the east; E. A. Chenery, of St. Louis, chairman; John L. Davis, of Chicago, and C. S. Rhoads, of Indianapolis, as the committee to have charge of the quarterly meetings in the west. These committees will notify the individual members of all quarterly meetings and the nature of the business to be transacted.

Mr. E. H. Grace, of Chicago, chairman of the standing committee on wire crossings, reported the work of his committee during the past year. Its labors consisted, among other things, in furnishing information to legislators regarding wire crossing on railroad rights of way. The report also included extracts from the state laws on the subject as found in various western and southern

states. Loose practice in the construction of wire lines across railroads is still prevalent.

The committee on uniform pole construction has submitted to the members a list of questions, and from the answers a paper will be prepared on this subject for the next annual meeting.

Mr. J. L. Davis, of Chicago, read the report of the committee on Uniform Transfer Blanks, which were designed for the purpose of transferring incomplete business from one operator to his relief when his duties have been finished.

While in Atlantic City the members were invited by Mr. Marshall, of the United Wireless Company, to visit the wireless station there, which was in constant communication with ships at sea and with stations along the coast.

The manufacturing and supply concerns that exhibited in connection with the twenty-sixth annual convention of the Association of Railway Telegraph Superintendents are as follows:

Leeds & Northrup Company, The, Philadelphia, Pa.—Complete line of portable testing sets. Represented by Julius Bernstein.

National Telegraphone Company, Rochester, N. Y.—Compact wall type and desk type of standard composite railway sets, portable composite sets. Represented by Jay G. Mitchell.

North Electric Company, The, Cleveland, O.—Fifty-line magneto switchboard, with magneto visual signals and drops, standard compact type bridging wall telephones, desk bridging telephones, 10-line and 20-line rural switchboards, miscellaneous equipment. Represented by Jay G. Mitchell.

Railroad Supply Company, The, Chicago, Ill.—Lightning arresters. Represented by Eugene W. Vogel.

Sandwich Electric Company, Sandwich, Ill.—Telephone, telegraph and composite apparatus. Represented by H. O. Rugh, E. C. Hennis, Louis Casper.

United Electric Company, New York, N. Y.—The Gill telegraphic selector shown in various applications for the calling of telegraph offices, setting of signals, etc. Represented by Howard E. Merrell, Edwin R. Howard, W. H. Merrill, Harrison Osborne.

Western Electric Company, Chicago, Ill.—Telephone, telegraph and composite apparatus. Represented by W. E. Harkness.

Strength of Red and Yellow Douglas Fir for Bridge Stringers.

THE Forest Service of the U. S. Department of Agriculture has recently issued the following information on the strength of red and yellow Douglas fir for use in bridges.

The terms red and yellow fir are not thoroughly defined. By some, only close-grained, bright yellow sticks are designated yellow fir and all other sticks called red fir, while others call only close-grained sticks of a pronounced red color, red fir and all other material yellow fir. Both red and yellow fir are secured from the same species, Douglas fir, and often from the same tree.

Strength of Red and Yellow Douglas Fir Bridge Stringers

(Yellow fir expressed in per cent of red fir)

Kind of fir	Grade	Number of tests	Rings per inch	Per cent moisture	Weight per cu. ft in pounds: As tested	Weight per cu. ft in pounds: Oven dry	Fiber stress at elastic limit	Modulus of rupture	Modulus of elasticity
							lbs. per sq. in.	lbs. per sq. in.	1,000 lbs. per sq. in.
Red	Select	48	10.5	29.6	36.2	29.5	4,427	6,974	1,645
Yellow	"	45*	17.5*	87.0	94.0	97.0	101	96	100
Red	Merch.	71	9.0	29.7	35.9	27.7	4,056	6,019	1,534
Yellow	"	38*	16.4*	90.0	97.0	99.0	101	102	97
Red	Seconds	43	7.5	27.4	35.7	28.0	3,674	4,923	1,319
Yellow	"	11*	14.5*	93.0*	104.0	105.0	99	106	98

* Not expressed in per cent

TABLE OF STRENGTH DATA ON RED AND YELLOW DOUGLAS FIR FOR BRIDGE STRINGERS.

An analysis of the strength tests made by the Forest Service on Douglas fir bridge stringers is shown in the attached table. These stringers were graded according to the export grading rules of the Pacific Coast Lumber Manufacturers' Association, and in the table are grouped by grades. In classifying the stringers according to color, all timbers of a reddish tinge were called red fir and all of a yellowish tinge were called yellow fir. The rings per inch shown in the table indicate that yellow fir is of slower growth than red fir. It also ranges higher in grade. Of the 94 yellow fir stringers tested 47.8 per cent were selects, 40.4 per cent were merchantables and 11.8 per cent seconds. Of the 162 red fir stringers tested 29.8 per cent were selects, 43.8 per cent were merchantables and 26.6 per cent seconds, but, grade for grade, these tests show that there is practically no difference in the strength and stiffness of red and yellow fir in bridge stringer sizes.

Track Elevation, Long Island R. R.

RAILROAD changes are being made on the Long Island Railroad to Manhattan Beach, since the final consent of the board of estimate and apportionment was obtained. Six tracks, four of the Brooklyn Rapid Transit and two of the Long Island, will be run on one embankment instead of two. The work is being executed under the direction of the Brooklyn grade crossing commission and is a part of the Bay Ridge improvement. These changes will remove, altogether, about eighty grade crossings on the Long Island Railroad between Bay Ridge and East New York and between Manhattan Beach Junction and Manhattan Beach.

The Brighton Beach improvement has been finished in about a year as far as the highway crossings are concerned. Over the highways steel bridges are constructed, resting on massive concrete abutments.

In about a year the Long Island Railroad tracks will be laid on the new elevated grade. Then, the present tracks to the East will be removed and the grade crossing eliminated from the junction to the beach will be complete.

Communications.

About Adjusting Curves.

Editor Railway Engineering:

I read with much interest your article on Railroad Curve Alignment as I have made a little study of this subject and have observed the application of many theories to practical problems. I agree with you on your general theory, but the rule given for the length of spiral will not hold in practice; thus a 4 degree curve would require an easement of 400 ft. on each end, which in many cases would be more than the whole curve, where the half of the easement is run back on main curve. And then the spiral would be unnecessarily long, since the elevation of the 4 degree curve would probably not exceed 6 inches; this would give 400 feet in which to attain the 6 inch elevation on the outer rail, or 66 ft. per inch.

A better rule for finding the length of spiral is found in the required elevation, and a good rule is to multiply the elevation of outer rail in inches by 50. By using this rule the rise in the outer rail is uniformly overcome, and as the elevation depends upon the speed and curvature both, it is seen that this rule should give better results.

My rule for finding the elevation of any curve for any speed is as follows: Multiply the square of the speed in miles by the degree of curve and by 66 and point off 5 decimals from right to left; for example: find the elevation of a 2 degree curve for a speed of 60 miles per hour; multiply 60 by 60 gives 3,600; multiply by 2 gives 7,200; multiply by 66 gives 473,200; point off 5 decimals from right to left gives 4.732 inches or 4¾ inches nearly.

Using the formula given in your May issue this problem would be figured as follows: 60 times 60 equals 3,600 radius of 2 degree curve 5,730 ÷ 2 = 2,865 ft.; divide 2,865 by 4 gives 711; divide 711 into 3,600 gives 5.06 inches which is excessive.

At any rate speed and curvature should be the factors considered in determining the length of curve easements. Of course modifications either way are necessary to the convenience of proper location, so in the case of the 2 degree curve and a speed of 60 miles per hour: multiplying 4¾ by 50 gives 237 feet; but by using a multiple of 25 for instance, 225 ft. or 250 ft. would answer.

Yours truly,

SUPERVISOR.

How to Find the Degree of Curve.

Editor Railway Engineering:

I have known for a number of years the rule of finding the degree of a curve by using a 62 ft. string and measuring the middle ordinate of the string, the number of inches of which give the degree of the curve. Can you explain in your valuable paper the geometrical principle involved?

Respectfully,

S. C. H.

There are no doubt many trackmen who are interested like Mr. S. C. H. and to whom an explanation of this rule will be welcome. In the accompanying diagram let C be the center of a circle having a radius of 5,730 ft. and let it be required to find the length of a chord AB whose middle ordinate DE shall equal *one inch,* the arc being a one degree curve. The problem may be worked in two ways; if we extend the radius EC beyond the center to F then we have by geometry:

$$AD \times DB = ED \times DF$$

from this formula we can find AD, as AD = DB.

ED and DF are given quantities, ED = 1 inch = .0833 feet, DF = 11459.9167; multiplying these two terms produces 954.6111, and extracting the square root we get 30.897 ft. which is half the required chord AB; thus multiplying by 2 we get 61.794 ft. or 61 ft. 9½ inches for the chord having a middle ordinate of one inch in a one degree curve.

Another way of solving the same problem is as follows: Draw AC then the triangle ACD is right angled, and by Euclid's 47th problem we have:

In this case AC = 5730 and CD = 5729.9167; thus squaring 5730 gives 32832900, and squaring 5729.9167 gives 32831945.3889; subtracting this from the former gives 954.6111 and extracting the square root will give 30.987 ft. or identically the same answer as in the first solution. It shows that the length of 62 ft. usually taken is slightly too long as the exact length should be 61 ft. 9½ inches.

To check this rule in order to see if it is good indiscriminately for all kind of curves, it is found by applying the above computation to a 10 degree curve the middle ordinate on the 61 ft. 9½ in. measures 9.996 inches, or practically 10 inches; on a 25 degree curve the middle ordinate is found to be 24.912 and on a 60° curve the middle ordinate is 58.716 inches. Thus it is seen that this chord of 61 ft. 9½ inches gives absolutely correct results

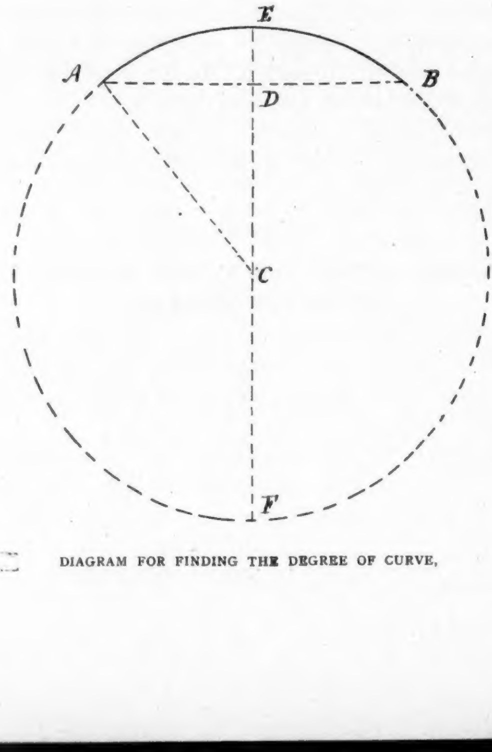


DIAGRAM FOR FINDING THE DEGREE OF CURVE.

up to a 10 degree curve; from 12° to 25° the results are very close the error on the 25 degree curve being only about 1-12 of a degree too small, and on a 60 degree curve the result is too small by only 1¾ degrees. Hence for all practical purposes the 61 ft. 9½ in. chord forms a very simple and accurate means for the trackman to determine the degree of curvature.

Trackmen should remember, however, that the radius of a curve is figured to the center of the track, and that by stretching the chord on the inside rail they are measuring a curve somewhat too sharp, and by measuring the outer rail the radius of curve is somewhat too long.

On curves 10 degrees or under it does not make any perceptible difference, but on sharper curves this must be taken into consideration; then, if accurate results are wanted, the chord should be applied to both the inner and outer rails, the observed middle ordinates added together and divided by two.

Prices on Track Materials, F. O. B. Chicago.

TRACK SUPPLIES.

Steel Rail, 60 lbs. and over	$28.00 per gross ton
Steel Rail, 30 to 45 lbs.	35.00 per gross ton
Steel Rail, 25 lbs.	36.00 per gross ton
Steel Rail, 20 lbs.	37.00 per gross ton
Steel Rail, 16 lbs.	38.00 per gross ton
Steel Rail, 12 lbs.	39.00 per gross ton
Ties, 6x8x8 oak, 1st grade	75 to 77c each
Ties, 6x8x8 oak, 2d grade	67c cash
Switch Ties	$30.00 to $35.00 M. ft.

Angle bars, accompanying rail orders, 1907 delivery, 1.65c.; car lots, 1.90c. to 1.95c.; spikes, 2.20 to 2.30c., according to delivery; track bolts, 2.65c. to 2.75c., base, square nuts, and 2.80c. to 2.90c., base, hexagon nuts. The store prices on track supplies range from 0.15c. to 0.20c. above mill prices. Switch set per turn out, 60-lb. rail, $75 to $100.

OLD MATERIAL.

	Per Gr. Per Ton
Old Steel Rails, rerolling	$18.00 to $18.50
Old Steel Rails, less than 3 ft.	18.00 to 19.00
Old Iron Rails	24.50 to 25.00

SHEET STEEL.

It is quoted for future delivery:

Tank plate, ¼-in. and heavier, wider than 6¼ and up to 100 in. wide, inclusive, car lots, Chicago, 1.88c., to 2.08c.; 3-16 in., 1.98c. to 2.18c.; Nos. 7 and 8 gauge, 2.03c. to 2.23c.; No. 9, 2.13c. to 2.33c. Flange quality, in widths up to 100 in., 1.98c. to 2.08c., base, for ¼-in. and heavier, with the same advance for lighter weights; Sketch Plates, Tank quality, 1.98c. to 2.18c.; Flange quality, 2.08c. Store prices on Plates are as follows: Tank Plate, ¼-in. and heavier, up to 72 in. wide, 2.20c. to 2.30c.; from 72 to 96 in. wide, 2.30c. to 2.40c.; 3-16 in., up to 60 in., wide, 2.30c. to 2.40c.; 72 in. wide, 2.50c. to 2.65c.; No. 8 up to 60 in. wide, 2.35c. to 2.45c.; Flange and Head quality, 0.25c. extra.

STUCTURAL STEEL SHAPES.

Store quotations are unchanged at 2.05c. to 2.10c., and mill prices are as follows: Beams and Channels, 3 to 15-in., inclusive, 1.88c.; Angles, 3 to 6-in., ¼-in. and heavier, 1.88c.; larger than 6-in. on one or both legs, 1.98c.; Beams, larger than 15-in., 1.98c.; Zees, 3-in. and over, 1.88c.; Tees, 3-in. and over, 1.93c., in addition to the usual extras for cutting to extra lengths, punching, coping, bending and other shop work.

CAST IRON PIPE.

Quotations per net ton on Water Pipe, 4-in., $38 to $39; 6 to 12-in., $37 to $38; over 16-in., $36 to $37; with $1 per ton extra for gas pipe.

CEMENT.

Good grade Portland Cement, car lots ...$2.00 per bbl.*

*(Four sacks per bbl. credited 10c. each when returned in good condition.)

SAND.

Bank sand, car lot	$0.55 per yd.
Torpedo sand, car lot	1.15 per yd.

CRUSHED STONE AND GRAVEL.

Crushed limestone, car lot	$1.05 per yd.
Crushed gravel, car lot	1.00 per yd.

Track Failure in England.

An unusual track failure occurred on the North Eastern Railway near Telling, England, on March 26th last. It seems that during the night of March 25th there was a heavy frost that was followed on March 26th by a calm atmosphere and a hot sun. The place of the track failure was in a cut and on a light grade. The banks of the cut prevented any cool breezes from coming into contact with the track and allowed the heat of the sun to be retained. The assumption is that the cinder ballast gave off heat by radiation. As it is the custom in that district for the track men to tighten up track bolts in the winter and loosen them a little to provide for expansion of steel in the summer, it seems that the loosening of bolts was neglected with the results of a track failure. Thirteen minutes before the accident occurred a train had passed over this track with safety.

It was noticed by an onlooker that a short distance in front of an approaching train in this cut that one rail length turned up in an S shape for a distance of two feet with a result that the train was derailed and a few injured. Eighty-four pound rails 30 ft. long were in the track with eleven 9 ft. ties to the rail.

As a result of this performance of rail, the railroad company has made some experiments to determine the effect of heat on track under various conditions. In making observations at different rail joints over a stretch of track one-quarter mile each way from the place of accident, it was found that practically all the expansion of the rails, caused by the difference of temperature from early morn to mid-day, was taken up in one joint for a stretch of three or four rail lengths. The width of the intermediate gaps at rail joints remained practically the same throughout the day. The normal gap between rail length is ordinarily ¼ inch and it was found at places that this was increased by the contraction of metal to ½ inch.

Personals.

Mr. W. E. Hebard has been appointed engineer of the Buffalo division of the Erie at Buffalo, N. Y., to succeed Mr. W. B. Taylor, resigned.

Mr. G. E. Boyd, roadmaster of the Illinois Central at Carbondale, Ill., has been transferred to Chicago, in place of Mr. L. A. Downs, who has been appointed assistant chief engineer of maintenance of way.

Mr. C. W. Haines, chief engineer Richmond Fredericksburg & Potomac, has resigned and the office has been abolished.

Mr. E. E. Burgess, acting chief engineer, has been appointed chief engineer of the St. Louis, Brownsville & Mexico, with office at Corpus Christi, Tex.

Mr. W. B. Bogart, has resigned as chief engineer of the Wichita Valley to take a position with the Kansas City, Mexico & Orient at Stamford, Tex.

Mr. J. A. Simmons, division engineer Natchez division Missouri, Pacific-Iron Mountain system at Ferriday, La., has resigned and is succeeded by Mr. J. A. Wright, heretofore roadmaster on the Valley division.

Mr. W. S. Bouton, chief bridge draughtsman of the Baltimore & Ohio, has been appointed assistant engineer of bridges and buildings, to succeed Mr. William Graham, resigned, with office at Baltimore, Md.

Mr. H. G. Kelley, chief engineer Minneapolis & St. Louis, has resigned to accept employment elsewhere. Officers and employes previously reporting to him will hereafter report to Mr. D. C. Noonan, general superintendent.

Mr. W. J. Black, engineer of maintenance of the New York, New Haven & Hartford, has been appointed assistant engineer of construction, in charge of the improvements at New Haven, Conn.

Mr. W. H. Sellew, division engineer of the Michigan Central at Detroit, Mich., has been appointed principal assistant engineer at that point. Mr. W. C. Cleveland succeeds Mr. Sellew as division engineer.

Mr. H. G. Kelley has resigned as chief engineer of the Minneapolis & St. Louis and the Iowa Central to become chief engineer in charge of maintenance of way of the Grand Trunk, with headquarters at Montreal, Que.

Mr. H. R. Safford, heretofore assistant chief engineer of the Illinois Central, and the Yazoo & Mississippi Valley, has been appointed chief engineer maintenance of way of those roads, with headquarters at Chicago. The office of assistant chief engineer has been abolished.

Mr. J. F. Peters, division engineer of the Missouri Pacific at Little Rock, Ark., has been transferred to the office of the principal assistant engineer at St. Louis, Mo. Mr. P. Carroll, division engineer at De Soto, Mo., succeeds Mr. Peters at Little Rock, and Mr. E. C. Welch, division engineer at Wichita, Kan., has been transferred to De Soto, Mo., in place of Mr. Carroll.

Mr. James M. Reid, chief engineer of the National of Mexico, has been appointed chief engineer of construction of that road, the Interoceanic of Mexico, the Mexican International and the Hidalgo and Northeastern, with headquarters at the City of Mexico. Mr. H. L. Cumming, assistant chief engineer of the National of Mexico, has been appointed engineer of maintenance of way, with office at Colonia station, City of Mexico.

Mr. W. D. Wheeler, Minneapolis, Minn., has been appointed chief engineer of the Iowa Central and Minneapolis and St. Louis railroads, succeeding Mr. H. G. Kelley, resigned.

Mr. John F. Stevens, who recently resigned as chief engineer of the Panama Canal, has been appointed vice-president of the New York, New Haven & Hartford R. R., with office at New Haven, Conn., and will have charge of all matter pertaining to operation.

Mr. R. J. Robinson has been appointed superintendent of the Shreveport and Minneola divisions, and the McKinney branch of the Missouri, Kansas & Texas Ry.

Mr. William McNab, heretofore assistant engineer of the Grand Trunk, has been appointed principal assistant engineer, with office at Montreal, Que.

Mr. G. H. Dukes, heretofore assistant engineer of the Hocking Valley, has been appointed chief engineer of the Sunday Creek Company, of Columbus, O. Mr. P. S. Cott, mining engineer of the Sunday Creek Company, has been appointed assistant engineer of the Hocking Valley at Columbus, O., in place of Mr. G. H. Dukes.

Mr. E. C. Hawkins has resigned as chief engineer of the Oregon & Washington to take charge of construction work on the Copper River & Northwestern, with headquarters at Katalla, Alaska.

Mr. Joseph Hobson, heretofore chief engineer of the Grand Trunk, has been appointed consulting engineer, with headquarters at Montreal, Quebec. Mr. Hobson is succeeded as chief engineer by Mr. Howard G. Kelley, as noted elsewhere in this column.

Mr. H. F. Baldwin, formerly chief engineer of the Chicago & Alton, and afterward vice-president and general manager of the Du Pont Powder Company of Wilmington, Del., has been appointed chief engineer of the Oregon & Washington, with headquarters at Seattle, Wash., to succeed Mr. E. C. Hawkins, resigned.

Mr. W. J. Carnohan has been appointed roadmaster of the St. Louis, Brownsville & Mexico at Kingsville, Tex. The office of chief engineer maintained during construction and filled by Mr. E. C. Burgess has been abolished. Mr. J. H. Woolery has resigned as superintendent of bridges and buildings and the office has been abolished.

Mr. J. Clifford has been appointed roadmaster of the St. Louis division of the Illinois Central at Carbondale, Ill., to succeed Mr. G. E. Boyd, who has been transferred to the Chicago division as roadmaster in place of Mr. L. A. Downs, who has been appointed assistant to the chief engineer maintenance of way of that road, the Yazoo & Mississippi Valley and the Indianapolis Southern, with office at Chicago. The office of assistant to the assistant chief engineer, heretofore held by Mr. P. Laden, has been abolished. Mr. J. H. Sheahan has been appointed roadmaster of the Freeport division of the Illinois Central at Freeport, Ill., in place of Mr. J. Clifford, and Mr. W. L. Love succeeds Mr. Sheahan as roadmaster of the Peoria division at Mattoon, Ill. Mr. P.

Agaard has been appointed supervisor of bridges and buildings of the Chicago division at Chicago, succeeding Mr. T. J. Fullem, who has been appointed superintendent of buildings at Chicago.

Mr. W. B. Blanton has resigned as superintendent of the Sierra Railway of California to accept a position with the Southern Pacific at San Francisco, Cal.

Mr. F. D. Hamilton has been appointed superintendent of terminals of the Tehuantepec National at Salina Cruz, Mex., to succeed Mr. H. A. Tolle, resigned.

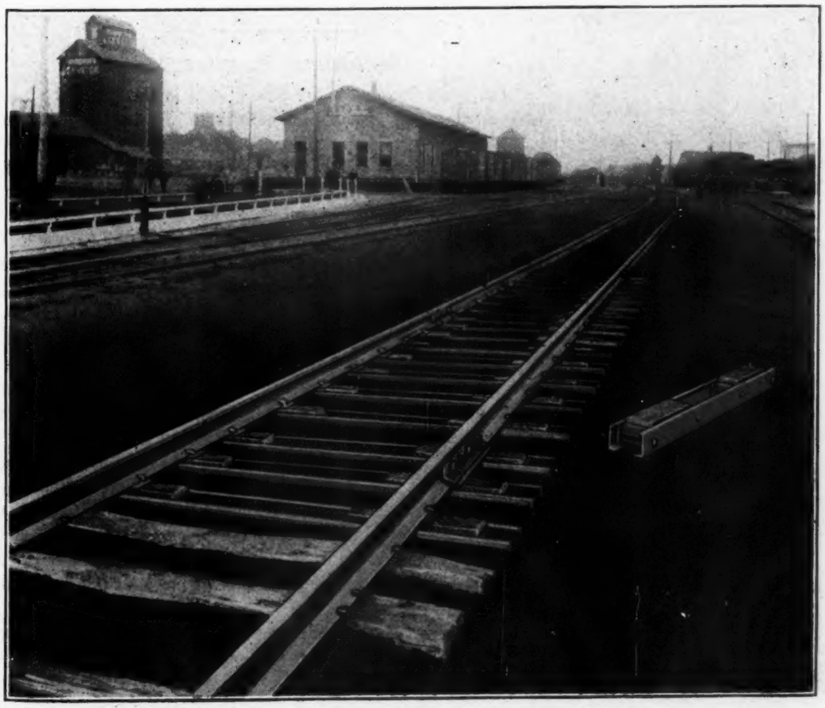
Mr. B. E. Palmer, heretofore assistant general superintendent of the Northern Pacific at Tacoma, Wash., has been appointed general superintendent of the western division.

The Galt Steel Cushioned Railroad Tie.

Among the steel ties on the market is one recently patented by Mr. Thomas A. Galt of Sterling, Ill. This tie is made of two five-inch channels bolted together, face to face, with wooden blocks inserted between channels that serve for two purposes. First, it furnishes a bearing surface for the rail as well as holding the spike and secondly, it holds the channels apart sufficient to allow the interior space to be filled with ballast. The wooden blocks are two feet long, eight inches wide and six inches deep, giving the rail much the same bearing as the ordinary wooden tie. The blocks can be easily replaced, without displacing the tie, in case they are damaged or rail worn. This obviates the necessity of retamping under the tie as is the case when replacing wooden ties. The ballast when well tamped between the channels of the tie holds the tie more firmly in the roadbed. In case of exceptional curavture where the tendency for the ties is to slide laterally a small tie anchor, in the form of an ordinary spike, may be attached to the tie and driven into the ballast. On the outside of the curve it has a tendency to hold the tie in place.

The wood block cushion for the rails gives the same insulation as an all wood tie for electric signal systems, where the rails are bonded or wired. The form of the construction of the tie also supplies an excellent place for inserting and protecting battery cells for any special signal desired at any point on the line.

The accompanying illustration shows a stretch of the Chicago & Northwestern Railway track at Sterling, Ill., where the Galt tie is in use. This picture was taken after the ties were in service six months.



GALT STEEL CUSHIONED RAILROAD TIE.

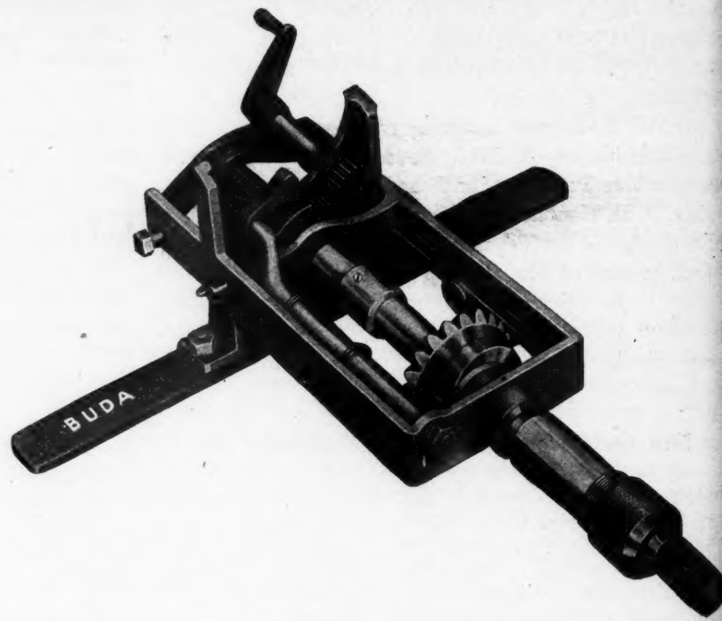
Trade Notes.

The Union Switch & Signal Company has a large number ot men at work on the site recently acquired for the erection of additional shops, which the company requires for the continued growth of the business. At present every department is working to its full capacity and with the amount of orders already on hand the management is looking forward to the completion of the new works so as to relieve the crowded condition of the old shops. The grading of the site for this new building has been completed, the foundations are now fairly under way and it is expected that work on the structural steel part will be commenced within the next ten days. This company has an unusual amount of routine orders on hand apart from the special work for the contract from the Pennsylvania Railroad on the New York and Long Island terminal equipment.

The Westinghouse Air Brake Company continues to keep all departments employed to their capacity, in spite of the fact that railroads, which are their chief customers, usually limit their orders at this period of the year.

Mr. A. A. Lane, engineer has become connected with the General Fireproofing Co., as office manager in charge of the reinforced concrete department, with headquarters at Youngstown, O. Mr. Lane has for some years been connected with the Taylor-Wilson Mfg. Co., previously was with the H. B. Camp Co., of Akron, O., and the National Fireproofing Co. Mr. H. A. McMoore, engineer, formerly with the Harlem Contracting Company of New York City, has been engaged by the General Fireproofing Company and is at present located at the home office and works in Youngstown, O. Mr. McMoore will be connected with the reinforced concrete department and will be particularly concerned in designing and estimating work in which the General Fireproofing Company's system is to be installed. Mr. O. H. Gentner, Jr., of Philadelphia, has been engaged as assistant engineer in charge of estimating and drafting in the reinforced concrete department of the General Fireproofing Company and will make his headquarters at Youngstown, O. Mr. Gentner has been with J. A. Patterson, consulting engineer on structural work; with G. W. & W. D. Hewitt, and Ballenger & Perrot, architects, Philadelphia, on concrete construction and structural work; and with the Unit Concrete Steel Frame Company, Tucker & Vinton, and the Vulcanite Paving Company, in charge of reinforced concrete work. During the past nine years he has been connected with the design and construction of more than two hundred reinforced concrete structures.

New Style Paulus Drill.



The Paulus drill which has been largely used on railroads for many years has recently been improved by its manufacturers, the Buda Foundry & Manufacturing Company, Chicago, and the accompanying illustrations show the new-style Paulus drill as it is now placed upon the market.

In general appearance the drill resembles its predecessor, the best points of the old-style drill having been retained. The frame, which is still made to collapse backward to clear passing trains, is of heavier design. It is of "T" section and gives greater strength with considerable less material. The new drill may be used in connection with the heaviest kinds of work.

The variable feed device is a simple, efficient arrangement. The pawl, attached to the rocker arm, slides along the top of the semi-circular shield and drops into the ratchet wheel that actuates the feed screw. As shown in the illustration the pawl drops into but one notch thus providing a very light feed. The shield is slotted at the hidden end and held in place by a thumb screw at the side of the frame. When the shield is moved back, the pawl drops into the ratchet wheel, thus feeding one, two, or three teeth at each revolution of the spindle as desired.

A dust-proof ball-bearing thrust is located between the feed screw and the spindle proper. The work of the operator is much lightened by this arrangement.

The new machine is also provided with a small crank handle at the rear of the base that enables the bit to be fed up to or quickly returned from the rail. Only a few seconds is required for this and during the placing of the bit against the work the handles of the drill do not turn or does the spindle revolve. This is a convenience that will appeal strongly to users.

The adjustable handles with which this drill is equipped is an entirely new idea. In drilling hard rail, and in using large bits it is considered an advantage to lengthen the handles so that greater leverage may be obtained by the operator. In using smaller bits and in drilling softer rail quicker work may be done by shortening the handles. The handles are set in place by thumb screws and are prevented, by a lug, from dropping out of the sockets and becoming lost should one of the set screws be left loosened.

Twist bits with the old-style spindle may be used if desired, but the makers recommend the use of the Rich flat bits of high speed steel. This requires the use of the Rich spindle with which the machine is shown equipped. These bits are claimed to ordinarily drill ten to fifteen times as many holes as twist bits before it is necessary to sharpen them.

Technical Publications.

"The Field Engineer," by Shunk, will in the future be bound without the flap. It will be bound in full leather, as heretofore, but as so many objections have been raised to the flap, in its use as a pocketbook in the field, the publishers have concluded to do away with that feature. The price will remain the same, i. e., $2.50.

"Railway Organization and Working," edited by Ernest Ritson Dewsnup. Published by The University of Chicago Press, Chicago. Cloth binding, 498 pages, 5½x7½ inches. Price $2.00 net; $2.16 postpaid.

The book was compiled from lectures of the past several years delivered by experts before the University of Chicago classes in railway transportation. These lectures are especially valuable to railroad employees, giving them a broader knowledge of the various departments of the American railway system.

The book is one that may be read by technical as well as non-technical men. The engineer should be an expert in the engineering branch, as the accountant should be in his, but each should possess a general and accurate knowledge of the other's work. To this end the book is of great value, including lectures by men in charge of the various departments of the larger railroad companies of the country.

The book is also compiled for the student of railway economics. It is thought that he may acquire by means of it a clearer understanding of the railroad organization.